Trouble-shooting instructions : ALL-5007

BOSCH system : Alarm system 20i matic

Make of vehicle : General

Basic microcard : KFZ-0..

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SPECIAL FEATURES

This microcard, valid at the time of publication, contains trouble-shooting instructions for the following alarm system:

Auto Alarm 20i matic 0 335 411 9.. with trigger box 0 335 411 036
and evaluation electronics 1 987 335 012 also in combination with:

* Auto Alarm Plus 3 (wheel protection)
* Auto Alarm Plus 4 (passenger-compartment protection)
* Central-locking module
* Priming indicator (LED)

IMPORTANT:
Leads of ultrasonic sensor, of anti-tow safeguard and infrared pre-amplifier must not be extended and must not be laid in parallel.

STRUCTURE, USAGE

These brief instructions essentially comprise vehicle-specific special features and test specifications (set values).

In line with the customer complaint, the trouble-shooting chart leads to various causes/component faults.
A detailed description of trouble-shooting is given in the trouble-shooting chart in the basic instructions.
NOTE: Even if reference is made to basic instructions, the set values, terminal assignments and special features indicated in these vehicle-specific brief instructions are always binding.

SAFETY AND PRECAUTIONARY MEASURES

As a general rule alarm systems are maintenance-free. Attention must be paid to the following when working on vehicles with an alarm system fitted.

* Detach plug of electronic trigger box when carrying out welding work using electric welding equipment.
* When performing painting work, the electronic trigger box may be subjected to max. + 95° C for brief periods and max. +85° C for long periods (approx. 2 hours).
* Make sure battery terminals are properly tightened at terminal posts of battery.
* Do not use a fast charger to start engine.
* Never disconnect battery from vehicle electrical system with engine running.
* Detach battery from vehicle electrical system when carrying out fast charging.
* Do not detach or attach wiring-harness plugs of trigger boxes with ignition switched on.

TEST PREREQUISITES

* Alarm system installed as per installation instructions.
* All plug contacts O.K.
* Spring contacts in plugs engaged.

TROUBLE-SHOOTING CHART

Customer complaint (fault symptoms)

The fault characteristics outlined below may be due to one or more faults.

1. False alarm with Auto Alarm 20i matic following installation with system primed.	2. False alarm with Auto Alarm 20i matic after system has already been functioning properly for some time.	3. No alarm with Auto Alarm 20i matic, alarm system switched on by way of infrared key.	Cause (component fault)
X			Circuit fault on installation of system, door contacts must not be connected to S- and S1-
X			Contact switches of hood and trunk lid are not connected to S- and S1-
X	X		Positive or negative fan motor incorrectly connected
	X		Loose contact in ground lead of load routed via terminal R of alarm relay
	X	X	Short circuit or short to ground between leads
		X	Contact switches, leads or fuse defective
		X	Interior lamp on: Power supply of alarm relay interrupted; alarm relay, evaluation electronics or alarm horn defective

TROUBLE-SHOOTING CHART (CONTINUED)

Customer complaint (fault symptoms)

The fault characteristics indicated below may be caused by one or more faults.

4. No alarm in the case of Auto Alarm 20i matic, alarm system primed via infrared key.

5. No alarm in the case of Auto Alarm 20i matic with additional Auto Alarm Plus 3 (wheel protection). Alarm system primed.

6. No alarm in the case of Auto Alarm 20i matic with additional Auto Alarm Plus 4 (passenger compartment protection). Alarm system primed.

7. Sudden alarm in the case of Auto Alarm 20i matic with Auto Alarm Plus 4 and auxiliary heating.

4	5	6	7	Cause (component fault)
X				If engine compartment or trunk lighting O.K., fault is to be found in alarm relay or lead
X				Short circuit or short to ground in contact switch or lead to connected load
	X			Plug connections dropped off at alarm relay or angle encoder
	X			Evaluation electronics, wheel protection or angle encoder defective
		X		Evaluation electronics or ultrasonic detector defective
			X	Movement of air in passenger compartment due to start-up of auxiliary heating

TROUBLE-SHOOTING CHART (CONTINUED)

Customer complaint (fault symptoms)

The fault characteristics indicated below may be caused by one or more faults.

8. Restricted range of infrared key in the case of Auto Alarm 20i matic.

9. Auto Alarm System 20i matic cannot be primed with infrared key or cannot be switched off during alarm situation.

10. Sudden alarm in the case of Auto Alarm 20i matic without Alarm Plus 4 and auxiliary heating.

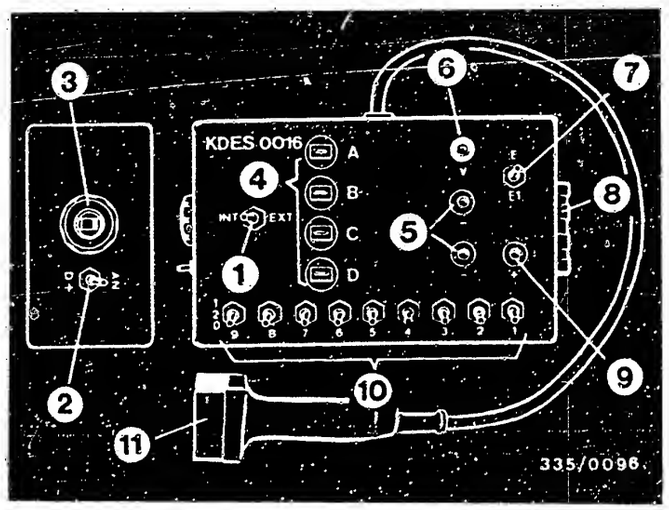
11. Alarm system is not automatically primed after 30 seconds.

12. Priming indicator in infrared pre-amplifier doesn't function.

8	9	10	11	12	Cause (component fault)
X					Batteries in infrared key defective or weak
	X				Infrared evaluation electronics defective
		X			Run-out of heating-blower motor acts as generator. Trigger box detects voltage via term. 15 and triggers alarm.
X	X			X	Infrared pre-amplifier (receiver) defective
			X	X	Alarm relay defective

RAPID DIAGNOSIS CHART FOR ALARM-SYSTEM TESTER KDES 0016

Test step	Testing of component/ function	Additional operation	Test conditions/ test instructions/ possible causes of trouble	Set values
1	Hand transmitter Priming and depriming of alarm system.	Set encoding switch, item 10 to code of hand transmitter to be tested.	* Plug, item 11 connected to tester. * Switch 2 set to D+ * Switch 1 set to int. * Switch 7 set to E1	
		Apply voltage of approx.12 V. Item 9 (+) Item 5 (–)	For testing the hand transmitter, use is made of the built-in components in the tester (infrared pre-amplifier and evaluation electronics).	
	Priming	Direct hand transmitter towards infrared pre-amplifier and press button on hand transmitter	LED in hand transmitter must light up brightly	LED in infrared pre-amplifier flashes for approx. 3 s
	Depriming	Direct hand transmitter towards infrared pre-amplifier and press button on hand transmitter	LED in hand transmitter must light up brightly * Hand transmitter defective * BA in hand transmitter too weak * Tester KDES 0016 defective	LED in infrared pre-amplifier lights up constantly for approx. 3 s

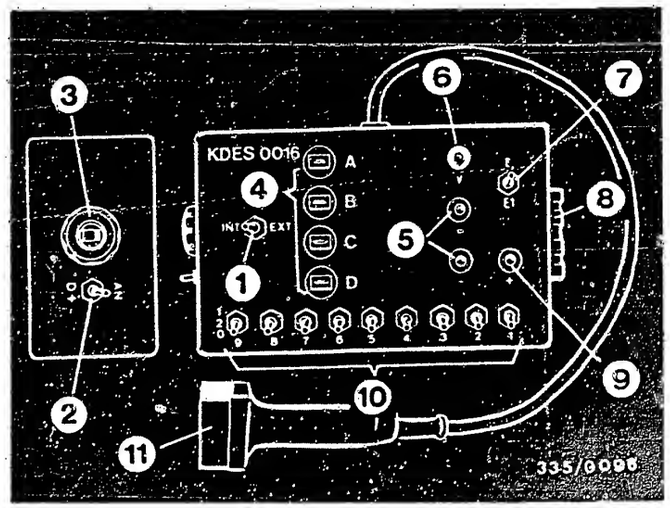


1 = Changeover switch for infrared pre-amplifier (internal/external)
2 = Nonlocking switch D+/AN
3 = Infrared pre-amplifier installed.
4 = Flat-contact sockets for external infrared pre-amplifier.
5 = Ground sockets
6 = Measurement output
7 = Changeover switch E/E1
8 = Evaluation electronics installed.
9 = Socket for voltage supply (+)
10 = Encoding switch 1 ... 9
11 = Plug for evaluation electronics

A for red lead (+)
B for black lead
C for grey lead
D for brown lead (–)
of infrared pre-amplifier, external.

RAPID DIAGNOSIS CHART FOR ALARM-SYSTEM TESTER KDES 0016 (CONTINUED)

Test step	Testing of component/ function	Additional operation	Test conditions/ test instructions/ possible causes of trouble	Set values
2	Evaluation electronics Actuation of LED and activation of evaluation electronics	For testing, use hand transmitter with same encoding as evaluation electronics. Apply voltage of approx. 12 V. Item 9 (+) Item 5 (–)	Evaluation electronics 1 987 335 012 removed * Detach plug for evaluation electronics, item 11 from tester and attach it to evaluation electronics 1 987 335 012 to be tested. * Switch, item 1 set to int. * Switch, item 7 set to E1 * Connect voltmeter to item 5 and item 6 To test evaluation electronics, use is made of the built-in infrared pre-amplifier in the tester and the appropriate hand transmitter for the evaluation electronics.	
	LED in infrared pre-amplifier		Nonlocking switch, item 2 set to D+	LED in infrared pre-amplifier lights up constantly
	Activation of evaluation electronics	Direct hand transmitter towards infrared pre-amplifier and press button on hand transmitter	LED in hand transmitter must light up brightly * Hand transmitter defective * Evaluation electronics defective * Tester KDES 0016 defective	Voltage on voltmeter goes to less than/equal to 1.5 V for approx. 3 s

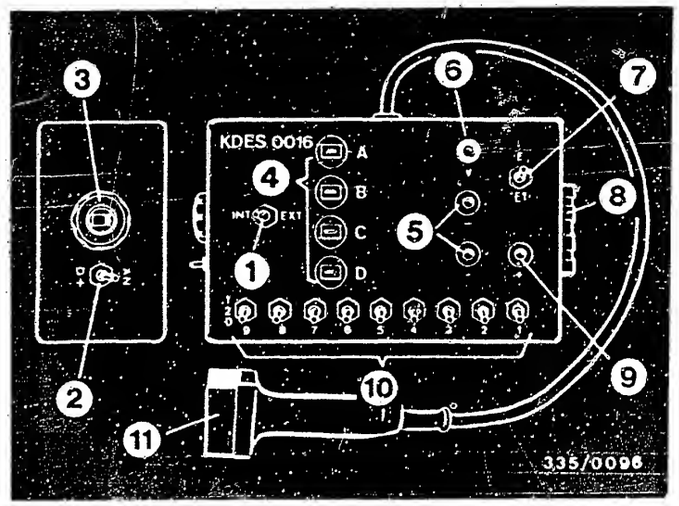


1 = Changeover switch for infrared pre-amplifier (internal/external)
2 = Nonlocking switch D+/AN
3 = Infrared pre-amplifier installed.
4 = Flat-contact sockets for external infrared pre-amplifier.
5 = Ground sockets
6 = Measurement output
7 = Changeover switch E/E1
8 = Evaluation electronics installed.
9 = Socket for voltage supply (+)
10 = Encoding switch 1 ... 9
11 = Plug for evaluation electronics

A for red lead (+)
B for black lead
C for grey lead
D for brown lead (–)
of infrared pre-amplifier, external.

RAPID DIAGNOSIS CHART FOR ALARM-SYSTEM TESTER KDES 0016 (CONTINUED)

Test step	Testing of component/ function	Additional operation	Test conditions/ test instructions/ possible causes of trouble	Set values
3	Infrared pre-amplifier Priming and depriming of alarm system	Use hand transmitter with same encoding as evaluation electronics for testing.	Infrared pre-amplifier 1 987 335 010 removed * Plug, item 11 connected to tester. * Switch, item 2 set to D+ * Switch, item 1 set to ext. * Switch, item 7 set to E1 * Connect ext. infrared pre-amplifier to tester: red lead to A black lead to B green lead to C brown lead to D	
		Apply voltage of approx.12 V. Item 9 (+) Item 5 (-)	To test infrared pre-amplifier, use is made of built-in evaluation electronics in tester and an arbitrary hand transmitter. The code of the hand transmitter must be set on the tester with the encoding switches, item 10.	
	Priming	Direct hand transmitter towards infrared pre-amplif. and press button on hand transmitter	LED in hand transmitter must light up brightly	LED in infrared pre-amplifier flashes for approx. 3 s
	Depriming	Direct hand transmitter towards infrared pre-amplifier and press button on hand transmitter	LED in hand transmitter must light up brightly * Evaluation electronics in tester incorrectly coded * Hand transmitter defective * Infrared pre-amplifier defective * Tester KDES 0016 defective	LED in infrared pre-amplifier lights up constantly for approx. 3 s



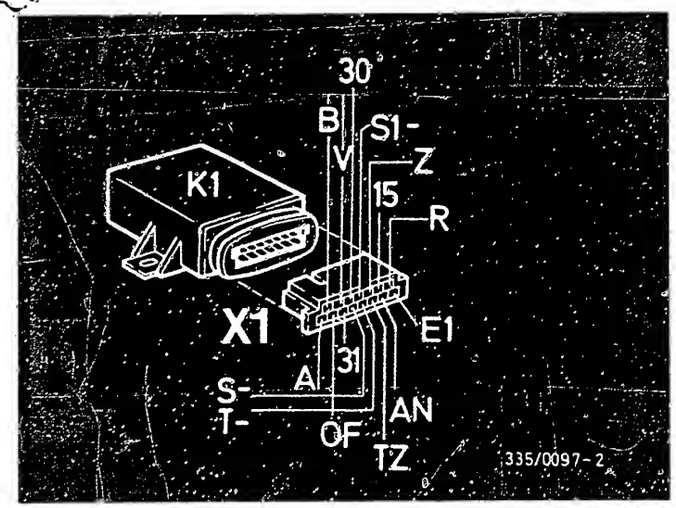
1 = Changeover switch for infrared pre-amplifier (internal/external)
2 = Nonlocking switch D+/AN
3 = Infrared pre-amplifier installed.
4 = Flat-contact sockets for external infrared pre-amplifier.
5 = Ground sockets
6 = Measurement output
7 = Changeover switch E/E1
8 = Evaluation electronics installed.
9 = Socket for voltage supply (+)
10 = Encoding switch 1 ... 9
11 = Plug for evaluation electronics

A for red lead (+)
B for black lead
C for grey lead
D for brown lead (-)
of infrared pre-amplifier, external.

RAPID DIAGNOSIS CHART

Component installed in vehicle (trigger box 0 335 411 036)

Test step	Testing of component/function Test instructions/conditions	Termi-nals	Set values
1	Supply voltage term. 30, ignition off, vehicle stopped	30	greater than/equal to 10 V
2	Supply voltage term. 15, ignition on, vehicle stopped	15	greater than/equal to 10 V
3	Supply voltage, relay contact for alarm horn actuation	B	greater than/equal to 10 V
4	Ignition off. Prime system with infrared key. If auxiliary unit "Plus 4" is connected. (voltage measurement) If auxiliary unit "Plus 4" is not connected (resistance measurement).	Z	primed < 2.7 V deprimed > 10 V primed < 1 k Ω deprimed > 1 M Ω
5	With additionally installed alarm system " Plus 4 " Alarm system primed: door closed door open Alarm must sound immediately on opening door.	TZ	greater than/equal to 10 V approx. 0 V



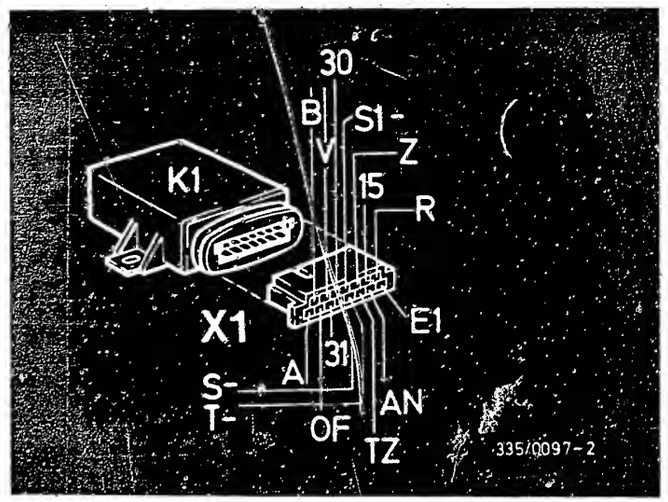
K1 = Alarm relay
X1 = Plug, alarm relay

Connections:
A = Alarm horn B1
AN = Evaluation electronics
B = Fuses, term. 30
E1 = Evaluation electronics
OF = Relay K2, term. 85
R = Ground loop
S- = Trunk switch
S1- = Engine compartment switch
T- = Door contact switch negative switching
TZ = Pass. compart. protection S-
V = Relay K1, term. 85
Z = Auxiliary units such as "Plus 3 or Plus 4"
15 = Ignition/starting switch S2, term. 15.
30 = Fuses, term. 30
31 = Vehicle ground

RAPID DIAGNOSIS CHART (CONTINUATION 1)

Component installed in vehicle (0 335 411 036)

Test step	Testing of component/function Test instructions/conditions	Terminals	Set values
6	AS primed: door closed door open Alarm must sound immediately on opening door.	T–	greater than/equal to 10 V approx. 10 V
7	AS primed: trunk lid closed open trunk lid Alarm must sound immediately on opening trunk lid.	S–	greater than/equal to 10 V approx. 0 V
8	AS primed: hood closed open hood Alarm must sound immediately on opening hood.	S1–	greater than/equal to 10 V approx. 0 V
9	Supply voltage term. 15, ignition on. If no relay is externally connected (resistance measurement) If relay is externally connected (voltage measurement)	V	primed > 1 M Ω deprimed approx. 0 Ω primed > 10 V deprimed < 2.7 V
10	Term. R must be connected to ground before priming alarm system. Prime alarm system with infrared key. Disconnect electrical connection at R. It must only be possible to switch off alarm with infrared key.	R	Alarm must sound immediately



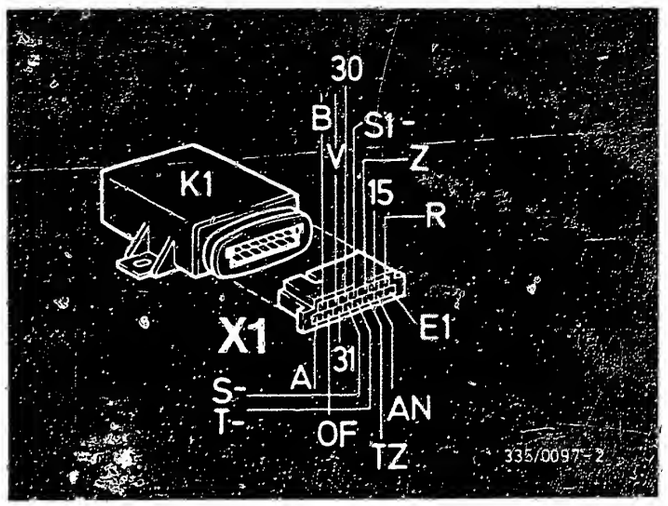
K1 = Alarm relay
X1 = Plug, alarm relay

Connections:
A = Alarm horn B1
AN = Evaluation electronics
B = Fuses, term. 30
E1 = Evaluation electronics
OF = Relay K2, term. 85
R = Ground loop
S– = Trunk switch
S1– = Engine compartment switch
T– = Door contact switch negative switching
TZ = Pass. compart. protection S–
V = Relay K1, term. 85
Z = Auxiliary units such as "Plus 3 or Plus 4"
15 = Ignition/starting switch S2, term. 15.
30 = Fuses, term. 30
31 = Vehicle ground

RAPID DIAGNOSIS CHART (CONTINUATION 2)

Component installed in vehicle (0 335 411 036)

Test step	Testing of component/function Test instructions/conditions	Terminals	Set values
11	AS primed, trigger alarm by opening door Use analog multimeter	A	less than 2 V greater than 10 V intermittent
12	AS primed, trigger alarm by opening door Use analog multimeter with relay Alarm system off	OF	less than 2 V greater than 10 V intermittent greater than 10 V
13	Ground connection from alarm relay to vehicle ground	31	approx. 0 Ω
14	Prime alarm system with infrared key Trigger alarm, LED in infrared pre-amplifier lights up	AN	Voltage goes to 0 V
15	Prime alarm system with infrared key	E1	Voltage goes from approx. 10 V for 3 s to less than/ equal to 1.5 V



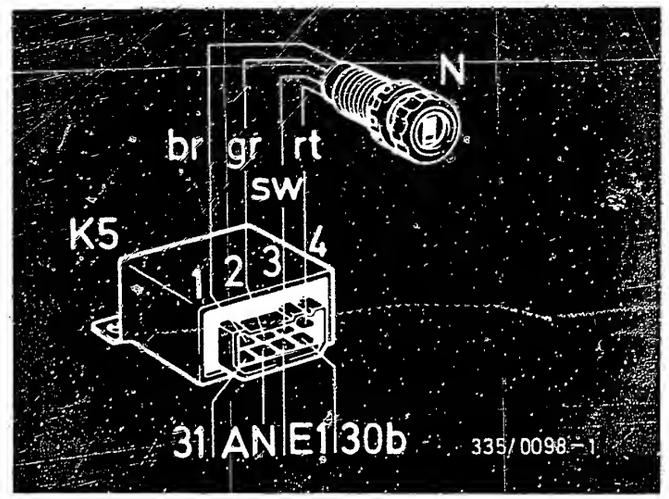
K1 = Alarm relay
X1 = Plug, alarm relay

Connections:
A = Alarm horn B1
AN = Evaluation electronics
B+ = Fuses, term. 30
E1 = Evaluation electronics
OF = Relay K2, term. 85
R = Ground loop
S- = Trunk switch
S1- = Engine compartment switch
T- = Door contact switch negative switching
TZ = Pass. compart. protection S-
V = Relay K1, term. 85
Z = Auxiliary units such as "Plus 3 or Plus 4"
15 = Ignition/starting switch S2, term. 15.
30 = Fuses, term. 30
31 = Vehicle ground

RAPID DIAGNOSIS CHART (CONTINUATION 3)

Evaluation electronics 1 987 335 012 only in conjunction with alarm relay 0 335 411 036 installed in vehicle

Test step	Testing of component/function Test instructions/conditions	Terminals	Set values
1	Given voltage at AN it must no longer be possible to prime AS AS deprimed	AN (ANZ)	greater than 2.5 V
2	Irrespective of whether AS primed or deprimed, briefly link electrical connection at E1 to term. 31. Alarm must be given immediately and it must only be possible to deactivate it with hand transmitter AS primed AS deprimed	E1	 greater than 10 V greater than 10 V
3	Supply voltage, evaluation electronics Ignition off	30b	greater than/equal to 10 V
4	Ground connection – evaluation electronics	31	approx. 0 Ω
5	Ground connection – infrared pre-amplifier (brown)	1	approx. 0 Ω
6	Signal line to infrared pre-amplifier (gray) Measure with analog multimeter Prime AS, LED flashes for approx. 3 s Deprime AS, LED lights up for approx. 3 s	2	 approx. 3...4 V approx. 6 V
7	Signal lead from infrared pre-amplifier (black), measure with analog multimeter	3	greater than 3 V/ less than 9 V pulsating
8	Supply voltage – infrared pre-amplifier (red)	4	greater than/equal to 10 V



K5 = Evaluation electronics
N = Infrared pre-amplifier

Connections:
AN = Alarm relay
E1 = Alarm relay
30b = Fuses, term. 30
31 = Vehicle ground
1 = Brown lead to N
2 = Gray lead to N
3 = Black lead to N
4 = Red lead to N

TEST SPECIFICATIONS

Auto Alarm 20i matic

* Battery voltage 10...13 V

* Priming delay:
After switching off ignition and leaving vehicle, i.e. opening of at least one door and closing of last door or trunk, the alarm system is primed automatically after 30 s.

* Alarm time audio 25...30 sec.
visual less than 4 min.

* Response time immediately

Auto Alarm Plus 3

* Battery voltage 9...13 V

* Adjustment time of angle encoder approx. 45...55 sec.

* Response time approx. 1... 2 sec.

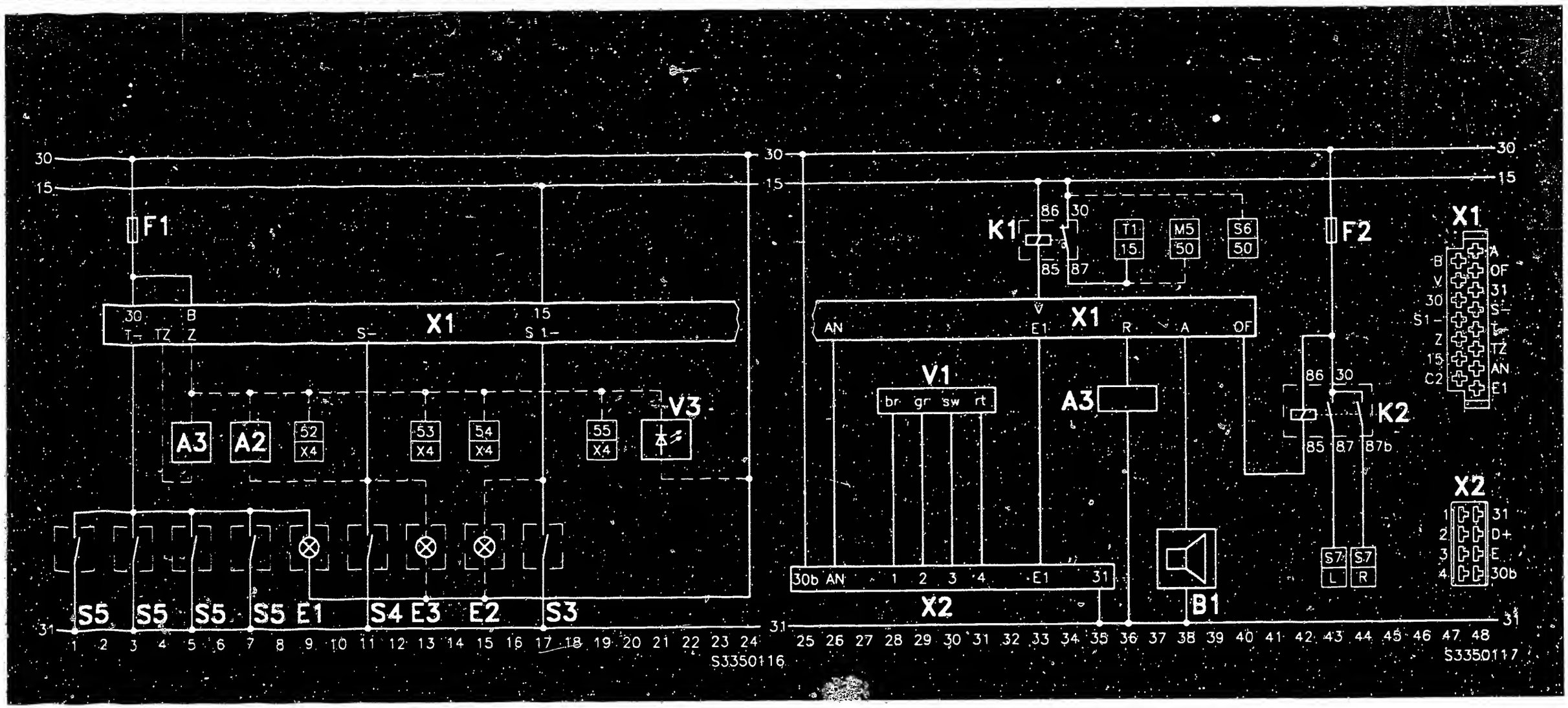
Auto Alarm Plus 4

* Battery voltage 10...13 V

* Alarm time audio 25...30 sec.
visual less than 4 min.

* Response time 1...2 sec.

For production reasons:
continued on the following coordinate.



ELECTRICAL TERMINAL DIAGRAM

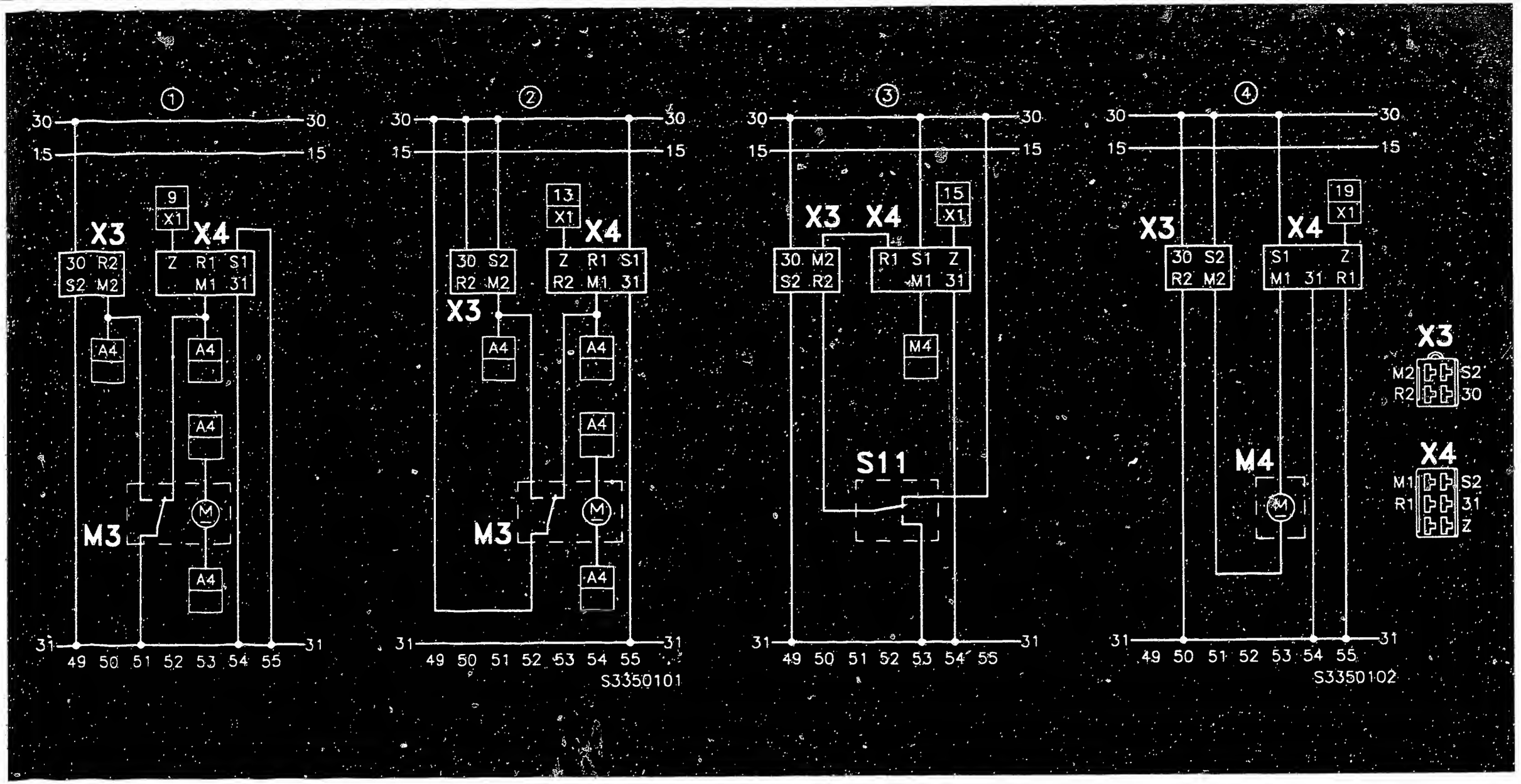
A1 = Car radio
A2 = Auto Alarm "Plus 3"
A3 = Auto Alarm "Plus 4"
B1 = Alarm horn
E1 = Interior lamp, front
E2 = Engine compartment light
E3 = Trunk light
F1, F2 = Fuses 8A

K1 = Relay for ignition/starting disable
K2 = Relay for visual alarm
M5 = Starting motor
S3 = Engine compartment switch
S4 = Trunk switch
S5 = Door contact switch, negative switching
S6 = Ignition/starting switch
S7 = Turn-signal switch

T1 = Ignition coil
V1 = Infrared pre-amplifier
V3 = Priming indicator LED
X1 = Plug, alarm relay
X2 = Plug, evaluation electronics

br = brown
gr = gray
rt = red
sw = black

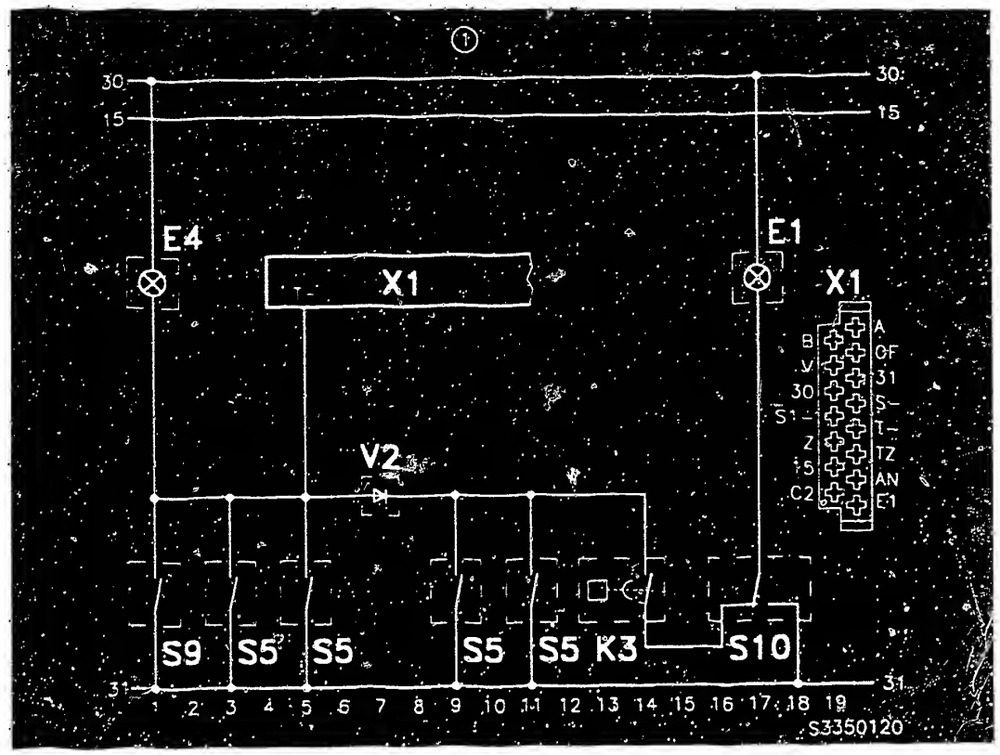
A23 ⟹
A24 ⟸



BASIC CIRCUIT OF CENTRAL-LOCKING MODULE

1 = Constant negative potential	2 = Constant positive potential	3 = Actuated with activator by pump	4 = With separate activator.

A4 = Central-locking control unit
M3 = Control motor
M4 = Control motor without activator
S11 = Door activator
X3 = 4-pole plug, central-locking module
X4 = 6-pole plug, central-locking module



SPECIAL CIRCUIT FOR REAR INTERIOR LAMP

E1 = Interior lamp, front
E4 = Interior lamp, rear
K3 = Time-lag relay
S5 = Door contact switch
S9 = Switch for interior lamp, rear
S10 = Switch in interior lamp, front
V2 = Blocking diode
X1 = Plug for alarm relay

INSTALLATION POSITION OF COMPONENTS

* Install alarm relay, central locking module in passenger compartment at arbitrary location (e.g. beneath instrument panel) with connections downwards.

* Infrared pre-amplifier in instrument panel or so as to be easy to operate from driver's door.

* Ultrasonic sensor in passenger compartment. Above rear-view mirror or in center of instrument panel.

* Anti-tow safeguard in passenger compartment or trunk.

* CL activator behind driver's door trim.

* Priming indicator (LED) at any readily visible location in passenger compartment.

Trouble-shooting instructions : AUD-5021

BOSCH system : Mono-Jetronic

Make of vehicle : AUDI

Basic microcard : KFZ-00..

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SPECIAL FEATURES

These trouble-shooting instructions, valid at the time of publication, apply to the following vehicle models with 1.7811/4-cyl. PM/4B engine:

AUDI 80	D	(EU)	6.87->
AUDI 100	EU		2.88->
AUDI 80/100	D		1.89->

* Mono-Jetronic with 25-pole control unit:
  0 280 000 701/702, .. 711/712, .. 716/717
  .. 722/723, .. 734/735
  Engine-speed triggering by means of TD-rectangular signals from term. 7 of ignition control unit.

* Self-diagnosis with flashing-code output, up to 7.88 diagnosis lamp in dash panel insert.
* Load recognition by means of throttle-valve potentiometer.
* Adaptive lambda closed-loop control with lambda sensor.
* Throttle-valve positioner with idle contact for idle speed regulation.
* Throttle-valve deflection with manual transmission by way of 4-bar linkage and closing damper.
* Plausibility, i.e. in the event of defective sensors a substitute value is provided by the control unit. This applies to following sensors: Temperature sensor (engine), temperature sensor (intake air) and idle switch.
* Pump relay for electric fuel pump.
* For testing fuel pressure, make use of pressure gauge KDJE-P100/17 and tubing of pressure measuring device.
  Connect up 3-way line KDJE-P 100/13 or connection part KDJE-P 100/14 (M14x1.5) between fuel inlet line and throttle-body injection unit.
* Intake-manifold preheating by means of heating resistor, 65°C thermoswitch and relay.
* Load-dependent flushing of active-carbon container by pulsed tank-ventilation frequency valve and switching valve.
* Resistance lead for injection valve instead of series resistor.

SPECIAL FEATURES (CONTINUED)

Attention is to be paid to the following items so as to avoid damage to the throttle-body injection unit.

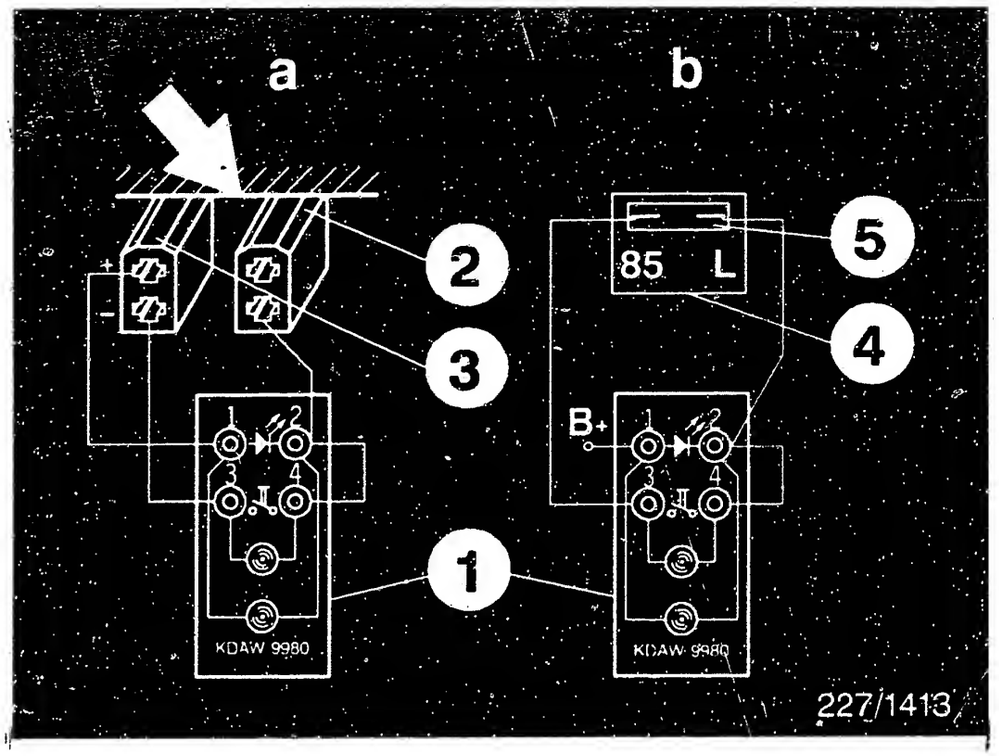
* The assignment screw (at the bottom of the throttle-plate lever) is not to be used for adjusting the idle speed. It serves to set the position of the throttle valve with respect to the throttle-valve positioner. This is only necessary when renewing the throttle-valve section or the throttle-valve positioner.

* Do not turn stop screw (minimum stop) of throttle valve as otherwise the control unit detects a fault. Screw is permanently set and secured against being turned.

* Do not actuate idle contact with throttle valve deflector (part and full-load range). This could cause the throttle-valve positioner to block.

* Do not loosen screws of pressure regulator. Do not exert pressure on upper section, as this may alter the fuel pressure.

* Do not adjust throttle-valve potentiometer. There is no service potential for checking assignment of throttle-valve position (angle) with respect to potentiometer.



1 = Evaluation unit KDAW 9980
2 = Diagnosis plug connection (brown) *
3 = Diagnosis plug connection (black) *
4 = Pump relay
5 = Plug-in socket for diagnosis contacts

SPECIAL FEATURES (CONTINUED)

Self-diagnosis

A flashing-code indication is required for reading out the fault memory. The following variants are possible as regards flashing-code readout depending on model, year of manufacture and type.
- By way of diagnosis lamp (LED) in dash panel insert or by connection of KDAW 9980.
- Stimulation/connection of KDAW 9980 (Figs. a and b) is effected by way of diagnosis connector in driver's-side footwell beneath cover or by way of diagnosis contacts on pump relay.

* = Colour may vary

SPECIAL FEATURES (CONTINUED)

Self-diagnosis

Test prerequisite:

* Voltage supply of control unit O.K.
  Battery positive : to term.4,
  Positive of term. 15: to term.9,
  Ground : to term.5 and term.25.
* Diagnosis lamp (LED) in dash panel insert (top picture) O.K.
  Positive of term. 15 : to diagnosis-lamp positive,
  ground to diagnosis lamp : from term. 22 of control unit.
* Diagnosis contact at fuel pump relay (centre picture).

Fault storage takes place in the event of:
* Test drive of at least 10 minutes duration or
* if engine won't run, actuate starting motor for approx. 6 secs.
  Do not switch off ignition.

Activation of self-diagnosis:

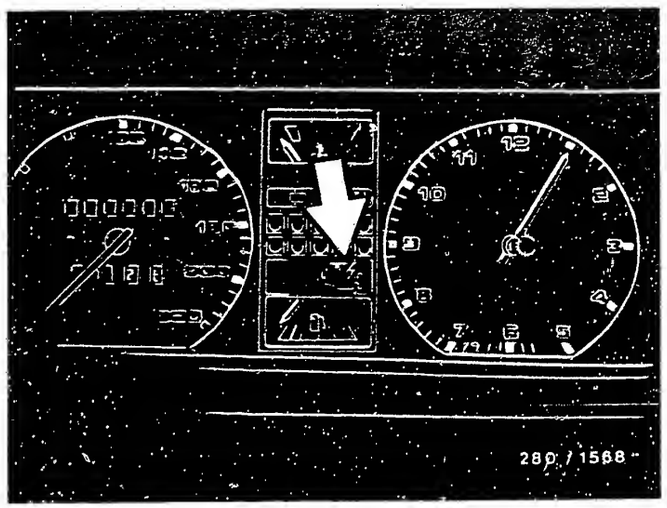
* Switch on ignition or allow engine to idle.
* Jumper diagnosis contact at fuel pump relay for at least 5 seconds or connect diagnosis plug connection (brown) for at least 5 seconds to ground or press button on KDAW 9980.
  Diagnosis lamp starts to flash.

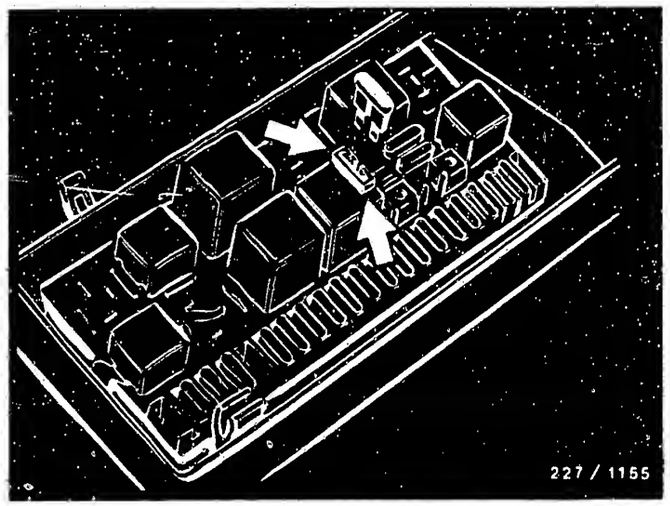
Readout of fault memory:
* Each flashing code consists of 4 flashing-pulse groups.
  A flashing-pulse group contains 1, 2, 3 or 4 falshing pulses.
  There are pauses of approx. 2.5 s duration between the flashing-pulse groups. Several faults may have been stored. Only one fault can be stored with the control unit 0 280 000 716/.

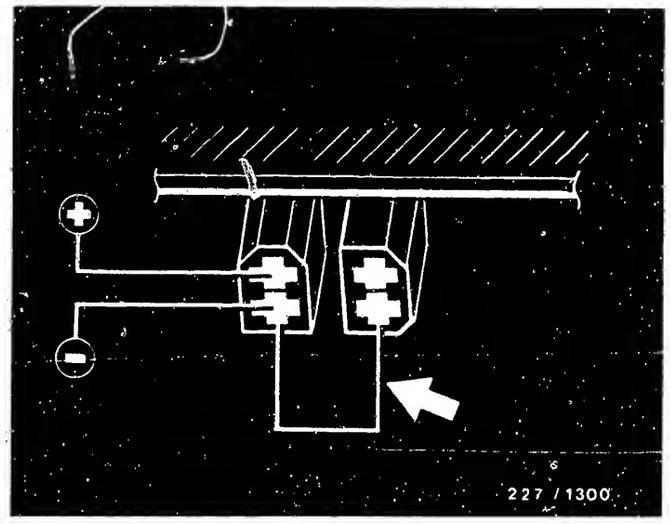
  Example: Pulse sequence || ||| |||| ||
  signifies flashing code 2 3 4 2

* The flashing code is repeated until the ignition is switched off or until the engine speed is increased to in excess of 2500 min^{-1}

Clearing fault memory:
* With ignition switched off, connect diagnosis plug connection (brown) to ground or press button on KDAW 9980.
* Switch on ignition and - after at least 5 s - break ground connection or release button.







STRUCTURE AND USAGE

These brief instructions encompass essentially vehicle-specific special features and test specifications (set values).

In accordance with the customer complaint, the trouble-shooting chart leads to different causes/component faults.
For a detailed description of trouble-shooting, see the information in the trouble-shooting chart of the basic instructions.

ATTENTION: Even if reference is made to basic instructions, the set values, terminal assignments and special features of these vehicle-related brief instructions are always binding.

Identical test-step numbering makes it easier to find individual test steps in the brief and basic instructions.

SAFETY AND PRECAUTIONARY MEASURES

In order to keep persons out of danger and to avoid damage to the engine, trigger boxes and control units or to the ignition system, observe the information in the basic instructions.

CAUTION!
High-performance ignition system with dangerous primary and secondary voltages!

Touching voltage-carrying components or terminals may prove fatal (both on the primary and secondary sides).

* Avoid injection of fuel when testing the compression.
To ensure this, disconnect pump relay.

For further precautionary measures, see brief instructions.

TROUBLE-SHOOTING CHART (CONTINUED)

Customer complaint (fault symptoms)

1. Starting motor operates, engine fails to start or starts only with difficulty.	2. Engine starts but then dies.	3. Idle problems (engine speed, exhaust gas).	4. Poor throttle take-up, flat spot during acceleration.	5. Engine missing (ignition, injection).	6. Maximum engine power/top speed not reached.	7. Fuel consumption too high.	8. Engine running on (dieseling).	9. Engine pinging/knocking.	10. Engine overheating.	11. Fault lamp.	Cause (component fault)
*	*	*	*	*	*	*			*	*	Self-diagnosis
*	*	*	*	*	*	*			*		Universal test adapter
*	*	*	*		*						Air-intake system
				*	*						Fuel delivery
*	*	*	*		*	*	*				Fuel pressure, leaks
		*		*	*	*	*				Solenoid-operated injection valve
				*							Alternator, interference-suppress.
*	*	*				*					Start control
				*		*					Overrun cutoff
		*	*	*		*					Engine-speed, CO setting
		*	*	*		*					Lambda closed-loop control
					*						Exhaust-gas catalyt. converter
		*	*				*				Tank ventilation

SELF-DIAGNOSIS TEST TABLE

Fault indication Flashing code	Testing of component/function	Test instructions/ Test conditions	Terminals	Set values
1 1 1 1	Control unit	Replace control unit without further testing.	—	———
2 1 2 1	Idle contact	Assignment screw of throttle-plate lever must close idle contact. Check resistance directly at throttle-valve positioner. Throttle valve closed: Throttle valve open: Check following leads: from control-unit plug to throttle-valve-positioner idle contact and to ignition-timing valve, from idle contact to engine ground.	3 - 4 3 - 3 4-grd	 0...0.5 Ω infinity Ω approx. 0 Ω approx. 0 Ω
2 1 2 2	No engine-speed signal	Check lead from control unit term. 1 to ignition trigger box term. 7. Check TD-rectangular signal with engine tester at control-unit plug term. 1. Check ignition system.	1 - 7 1 - 5	approx. 0 Ω Square-wave voltage min. 80 % U-battery
2 2 1 2	Throttle-valve potentiometer	Measure resistance value directly at throttle-valve potentiometer: Deflect throttle valve: Check leads from control unit to throttle-valve potentiometer: Lead from potentiometer to engine ground Short-circuit to + 5 V.	1 - 5 2 - 4 8 - 5 7 - 2 18 - 4 1-grd	 600...1400 Ω 400...4000 Ω Maximum at part load approx. 0 Ω approx. 0 Ω approx. 0 Ω approx. 0 Ω
2 3 1 2	Temperature sensor (Engine)	Measure resistance value directly at temperature sensor: at ambient temperature +15...+30°C: with engine at operating temp. approx. +80°C: Check leads from control unit to temp. sensor (NTC).	 2 -NTC NTC-grd grd-5	 1.45...3.3 k Ω 280...360 Ω approx. 0 Ω approx. 0 Ω approx. 0 Ω

SELF-DIAGNOSIS TEST TABLE (CONTINUED)

Fault indication Flashing code	Testing of component/function	Test instructions/ Test conditions	Terminals	Set values
2 3 2 2	Temperature sensor (intake air)	Measure resistance value directly at quadruple plug: at ambient temperature +15...+30°C: at approx.+50°C: Check following leads: from control unit term. 14 to temp. sensor term. 1 from engine ground to temp. sensor term. 4	1 – 4 14 – 1 grd–4	 1.45...3.3 k Ω 700 ...950 Ω approx. 0 Ω approx. 0 Ω
2 3 4 1	Lambda closed-loop control not within working range (control limits exceeded or undershot).	Open circuit in sensor lead or short circuited to ground or battery voltage. Pay attention to worn insulation. Check sensor heater Resistance value: Supply voltage : Sensor ceramics clogged. Intake system leaking. Tank-ventilation valve permanently open.	20	 1...15 Ω 8...15 V
2 3 4 3	Lambda closed-loop control has reached adaption limits.	Injection valve defective, check Resistance value: Check fuel pressure Set value:		1.0...1.6 Ω see test specifications on diagram
2 3 4 2	Lambda sensor	Open circuit in sensor lead or short circuited to ground or battery voltage. Pay attention to worn insulation. Sensor ceramics clogged. Resistance value: Check sensor heater Supply voltage :	20	 1...15 Ω 8...15 V
4 4 3 1	Throttle-valve positioner	Measure resistance directly at quadruple plug : Check following leads: from control-unit plug term. 24 to positioner term.1 from control-unit plug term. 23 to positioner term.2 Control unit defective.	1 – 2 24 – 1 23 – 2	4...250 Ω approx. 0 Ω approx. 0 Ω
4 4 4 4	No fault stored	Continue trouble-shooting in accordance with trouble-shooting chart		
0 0 0 0	End of fault output	If necessary, continue trouble-shooting in accordance with trouble-shooting chart		

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01
Adapter lead: 1 684 463 170

Test step	Switch V	Switch Ω	Terminals	Testing of component/function	Test instructions/ test conditions	Set values
1	5	–	1 – 5 (+) (–)	TD–speed signal from ignition trigger box term. 7	Transmission in neutral, start	Square–wave voltage min. 80% U–bat.
2	6	–	4 – 5 (+) (–)	Voltage supply of control unit		8...15 V
3	7	–	9 – 5 (+) (–)	Voltage supply via ignition term. 15	Switch on ignition	8...15 V
4	8	–	17 – 5 (+) (–)	Simulated actuation of electric fuel pump	Switch on ignition Press button 3	Electric fuel pump runs, check by listening
5	8	–	17 – 5 (+) (–)	Pump relay	Switch on ignition	8...15 V
6	9	–	15 – 5 (+) (–)	A/C readiness (if provided)	Ignition "on", switch on A/C	8...15 V
7	10	–	16 – 5 (+) (–)	A/C compressor (if provided)	Ignition "on", switch on A/C	8...15 V
8	12	–	12 – 5 (+) (–)	Tank–ventilation frequency valve	Switch on ignition Press button 4	Frequency valve must be energized, check by listening
9	13	–	3 – 5 (+) (–)	Ignition–timing valve	Switch on ignition Depress accelerator pedal somewhat	8...15 V
10	| V	5	22 – 5	Diagnosis lamp (LED) (if provided)	Press button 1	Diagnosis lamp lights up
11	| V	7	3 – 5	Throttle–valve positioner Idle contact	Detach plug of ignition–timing valve. Accelerator pedal in off–position : Depress accelerator pedal somewhat : Attach plug to ignition–timing valve.	0...10 Ω infinity Ω

B13 —— ⟹

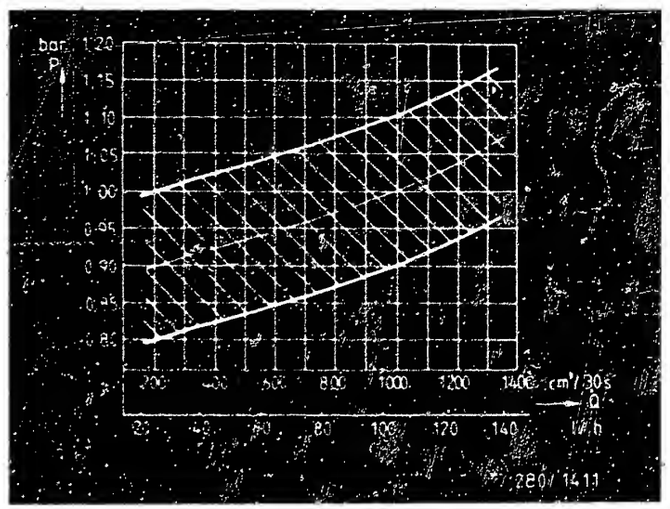
B14 —— ⟺

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01 (continued)
Adapter lead : 1 684 463 170

Test step	Switch V	Switch Ω	Terminals	Testing of component/function	Test instructions/Test conditions	Set values
12	V	8	6 – 5	Ground connection (transmission switch)	Ignition "OFF", manual transmission arbitrary, automatic P/N : automatic Drive:	0...10 Ω infinity Ω
13	–	–	–	not applicable		
14	V	10	11 – 5	Pump-encoding connection		0...10 Ω
15	V	11	14 – 5	Temperature sensor (intake air)	Ambient temperature +15...30 °C : at approx.+50°C:	1.45...3.3 k Ω 700 ...950 Ω
16	V	12	2 – 5	Temperature sensor (engine)	Ambient temperature +15...30 °C : Engine at operating temperature approx. +80 °C :	1.45...3.3 k Ω 280...360 Ω
17	V	13	25 – 5	Ground connection Output stage		0...10 Ω
18	V	14	13 – 5	Solenoid-operated injection valve and series resistor		6...12 Ω
19	V	15	8 – 5	Throttle-valve potentiometer		600...1400 Ω
20	V	16	7 – 18	Throttle-valve potentiometer	Deflect throttle valve (Maximum value at part load)	400...4000 Ω
21	V	20	23 – 24	Throttle-valve positioner		4...250 Ω

TEST SPECIFICATIONS

Component/function	Set values
Electric fuel pump	
* Delivery at return:	min. 650 cm ^{3} /30s
* Supply voltage under load:	min. 12 V
Pressure regulator	
* Fuel pressure with engine stopped:	see diagram
Solenoid-operated injection valve	
* Internal resistance between term. 2 and term. 3 at ambient temperature +15...+30 °C :	1,0...1,6 Ω
* Leakage after 60 s:	a maximum of 1 droplet may drip off
Resistance lead for injection valve	
* Internal resistance:	1...2,5 Ω
Throttle-valve potentiometer	
* Internal resistance between term. 5 and term. 1 :	600...1400 Ω
term. 4 and term. 2:	400...4000 Ω
Deflect throttle valve (Max. value at part load)	
Throttle-valve potentiometer	
* Internal resistance between term. 1 and term. 2 :	4...250 Ω
* Idle contact term. 3 and term. 4 :	0...0,5 Ω
Lambda sensor heater	
* Internal resistance (PTC) with engine stopped:	1... 15 Ω

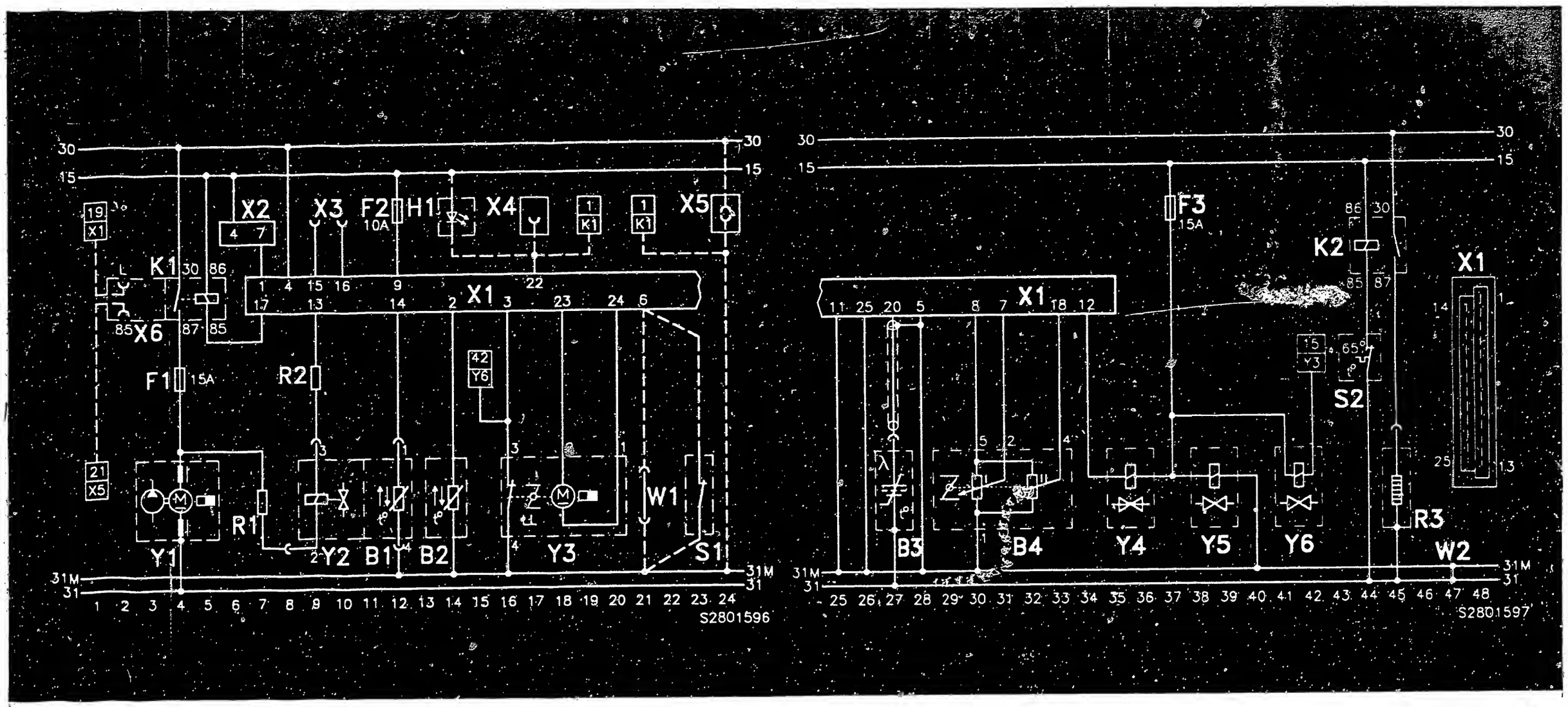


Q = Fuel delivery of electric fuel pump
p = Primary pressure

Component/function	Set values
Temperature sensor (engine) * Internal resistance at ambient temperature +15...+30 °C : with engine at operating temp. approx. +80 °C :	 1,45...3,3 k Ω 280...360 Ω
Temperature sensor (intake air) * Internal resistance between term. 1 and term. 4 at ambient temperature +15...+30 °C : at approx.+50°C :	 1,45...3,3 k Ω 700...950 Ω
Tank-ventilation frequency valve and tank-ventilation switching valve * Internal resistance at ambient temperature +15...+30 °C :	 35... 55 Ω
Start control * Voltage at injection valve Start initiation : after approx. 15s:	 greater than 1,0 V approx. 0,3 V
Idle Engine at operating temperature, approx. +80°C * Idle speed: * Lambda sensor voltage Emissions "lean": Emissions "rich": Idle speed and lambda closed- loop control cannot be adjusted (adaptive control)	 750...950 min $^{-1}$ 0,05...0,3 V 0,6 ...1,0 V

Component/function	Set values
Closing damper (manual transmission only) * Press-in travel of plunger, moved by throttle-plate lever:	 4,0...4,5 mm
Intake-manifold preheater (hedgehog) * Internal resistance between plug and ground with engine cold:	 0,25...0,5 Ω
Thermoswitch (red) for intake-manifold preheater * Internal resistance less than 55°C: above 65°C:	 approx. 0 Ω infinity Ω

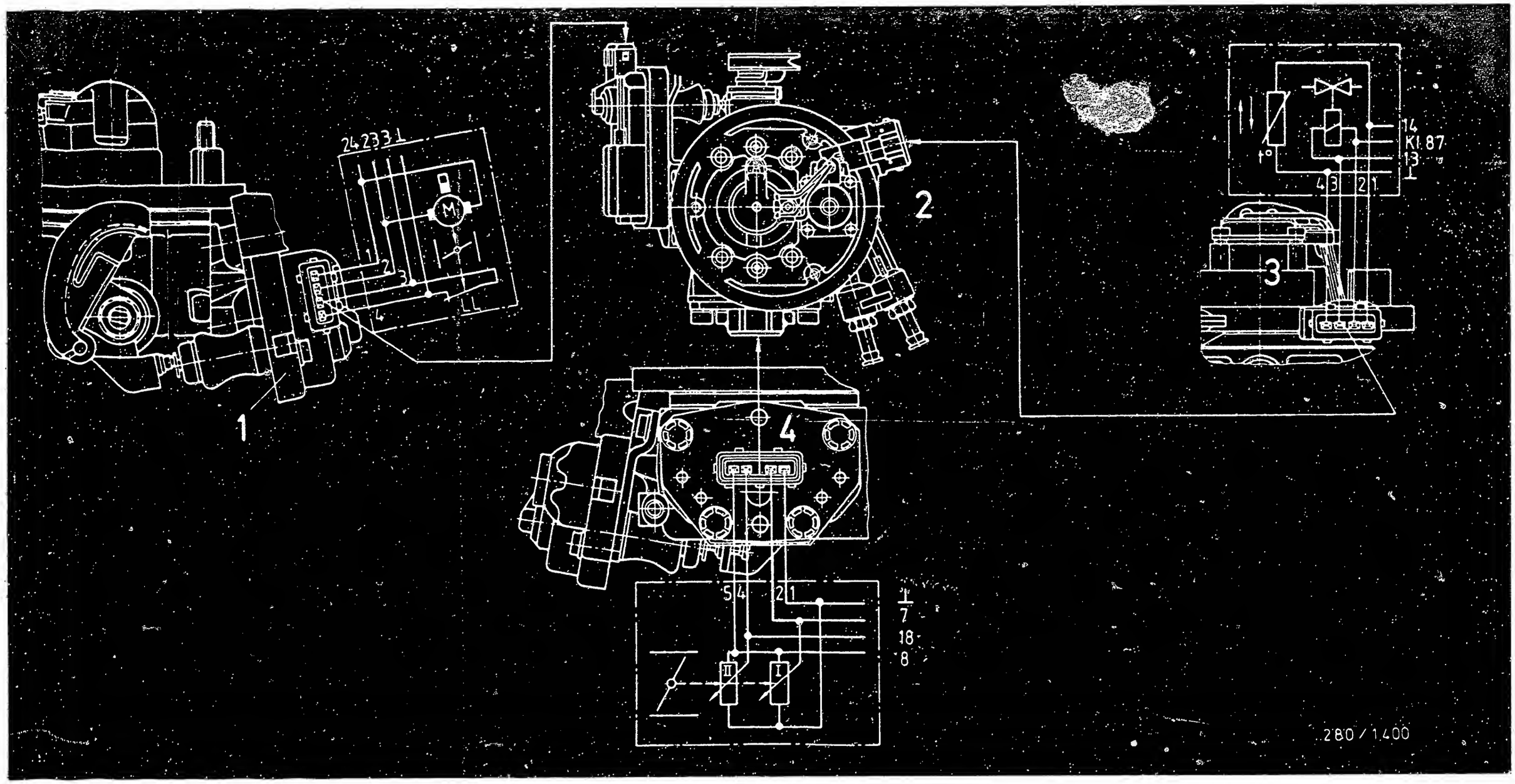
Refer to equipment and Autodata microcard for settings as regards ignition, valve clearance and other engine-related data



ELECTRICAL TERMINAL DIAGRAM

B1 = Temperature sensor (intake air)
B2 = Temperature sensor (engine)
B3 = Lambda sensor
B4 = Throttle-valve potentiometer
F1 = Fuse (fuel pump)
F2 = Fuse
F3 = Fuse
H1 = Diagnosis lamp (up to 7.88)
K1 = Pump relay
K2 = Relay, intake-manif. preheater
R1 = Resistance lead
R2 = Resistance lead
R3 = Intake-manifold preheater
S1 = Drive switch (automatic transmission only)
S2 = Thermoswitch
W1 = Jumper (manual transmission only)
W2 = Ground strap, engine
X1 = Control-unit plug, Monojetr.
X2 = Control-unit plug, ignition
X3 = Plug for A/C
X4 = Diagnosis plug connection (brown) (as of 8.88)
X5 = Diagnosis plug connection (black) (as of 8.88)
X6 = Diagnosis contact at pump relay (up to 7.88)
Y1 = Electric fuel pump
Y2 = Solenoid-operated injection valve
Y3 = Throttle-valve positioner
Y4 = Tank-ventilation frequency valve
Y5 = Tank-ventilation switching valve
Y6 = Ignition-timing valve

B21 —⟹
B22 ⟸—

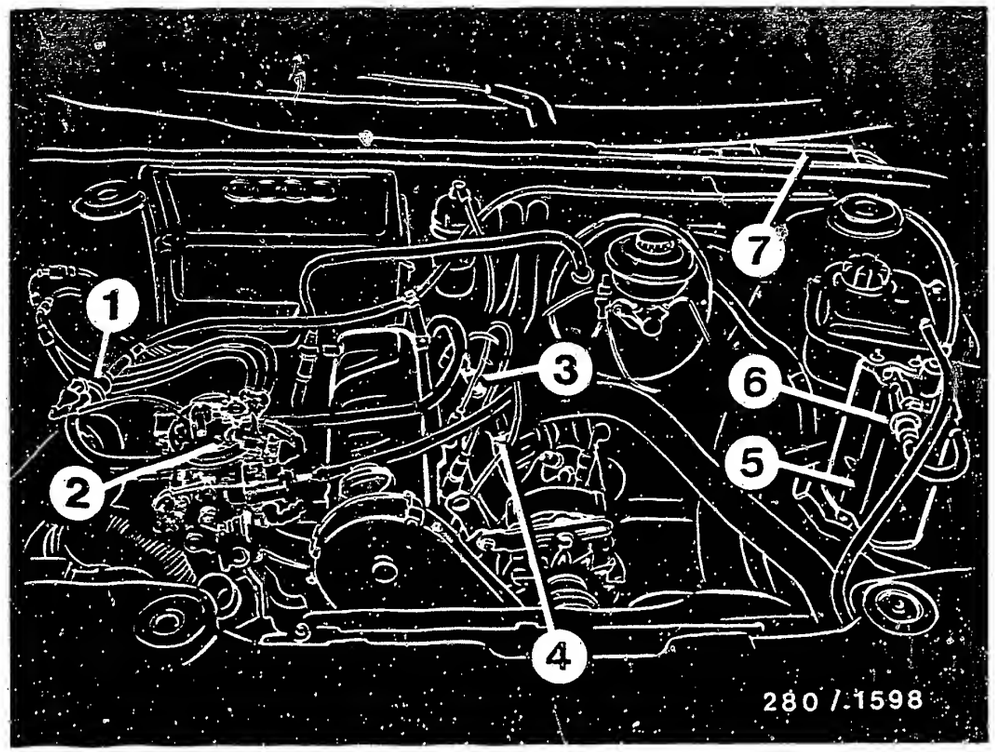


PLUG ASSIGNMENT OF THROTTLE-BODY INJECTION UNIT

1 = Throttle-valve positioner with idle contact
2 = Throttle-body injection unit
3 = Solenoid-operated injection valve and temperature sensor (intake air)
4 = Throttle-valve potentiometer

B23 ⟹

B24 ⟸



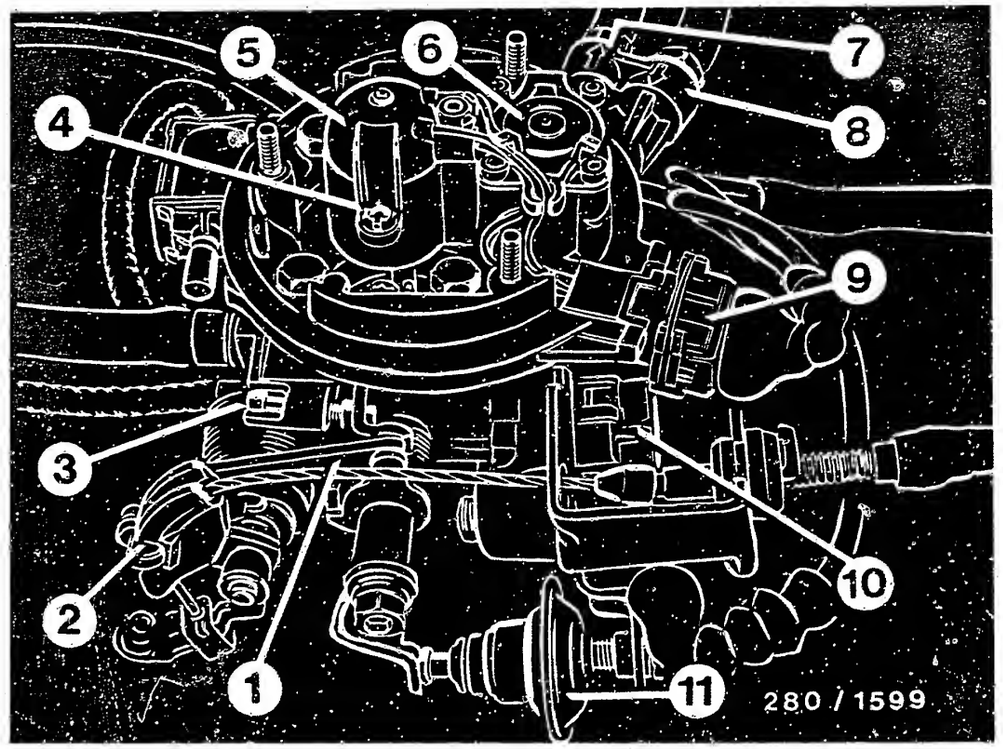
1 = Tank-ventilation switching valve
2 = Throttle-body injection unit
3 = Thermoswitch for intake-manifold preheating
4 = Temperature sensor (engine)
5 = Active-carbon container
6 = Tank-ventilation frequency valve
7 = Relay holder with fuse holder

INSTALLATION POSITION OF COMPONENTS

The pictures refer to the AUDI 80

All installation locations relate to the direction of travel.

Arrangement of components in engine compartment.



1 = 4-bar linkage to throttle-plate lever
2 = Pulley
3 = Secured stop screw (minimum stop)
4 = Temperature sensor (intake air)
5 = Solenoid-operated injection valve
6 = Pressure regulator
7 = Fuel return
8 = Fuel inlet
9 = Quadruple plug for injection valve and temperature sensor (intake air)
10 = Throttle-valve positioner
11 = Closing damper

INSTALLATION POSITION OF COMPONENTS (CONTINUED)

The electric fuel pump and fuel filter are located on the bottom of the vehicle ahead of the rear axle

The lambda sensor is installed in the exhaust manifold.

INSTALLATION POSITION OF COMPONENTS (CONTINUED)

* Top picture
  Arrow = Tank-ventilation switching valve

* Centre picture
  1 = Tank-ventilation frequency valve
  2 = Active-carbon container

* Bottom picture
  1 = Ignition-timing valve
  2 = Plug connection for throttle-valve potentiometer
  3 = Fuel return
  4 = Fuel inlet
  5 = Pressure regulator
  6 = Plug for injection valve and temperature sensor (intake air)

Further installation positions

* The sensor plug connection is located at the right-hand spring-strut dome at the front.

* The pump relay of the safety circuit is to be found at relay location 10 on the relay board in the plenum chamber on the left.

* The relay for the intake-manifold preheater is to be found at relay location 11 on the auxiliary relay holder in the driver's footwell beneath the instrument panel.

* The diagnosis lamp (up to 7.88) is located in the dash panel insert.

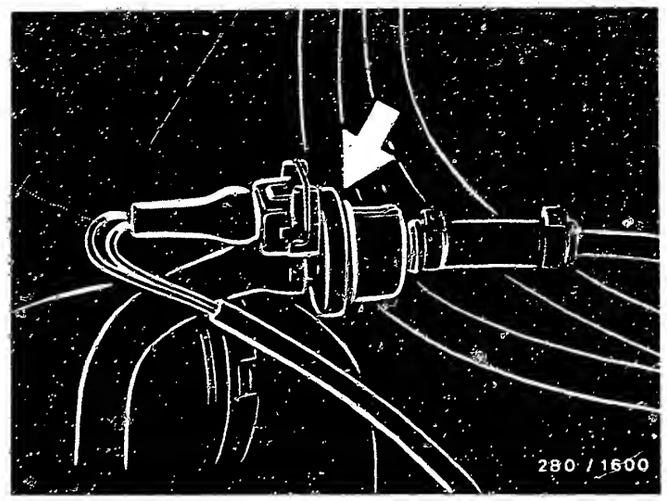
* The diagnosis contact (up to 7.88) is located on the pump relay.

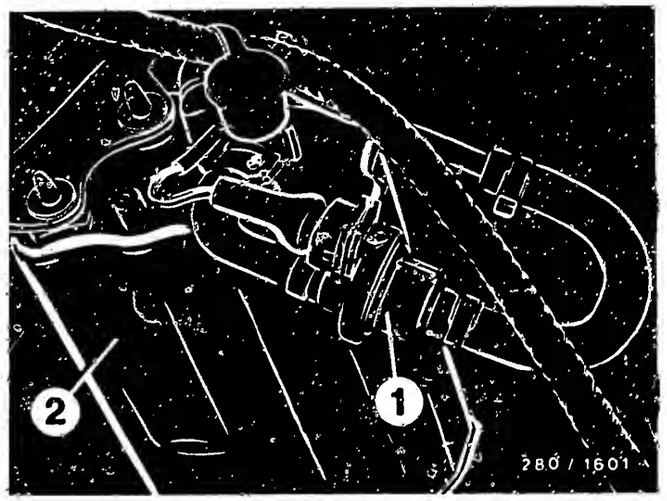
* The diagnosis plug connections (black) and (brown) are located (as of 8.88) in the driver's footwell at the front in a recess beneath the cover.

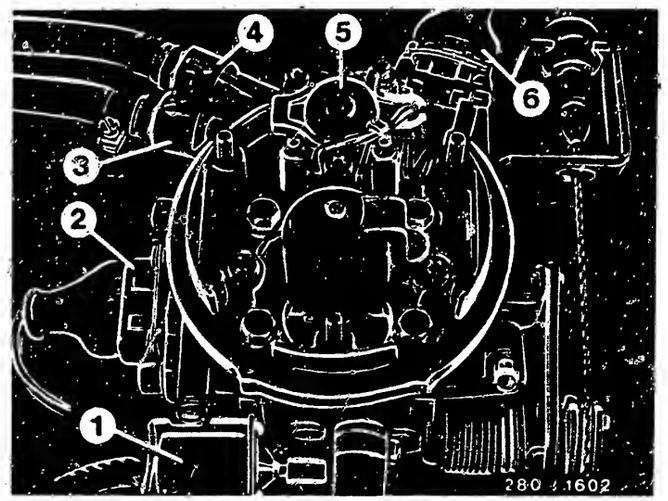
* The control unit is located in the passenger-side footwell beneath the glove compartment.

* The ground connection for the injection is located at the intake manifold in the vicinity of cylinder no. 1.

* The ignition control unit is located on the left in the driver's footwell beneath the plastic facing.







Trouble-shooting instructions : AUD-5006

BOSCH system : KE-Motronic

Make of vehicle : AUDI

Basic microcard : KFZ-00.

TABLE OF CONTENTS

SPECIAL FEATURES

These trouble-shooting instructions, valid at the time of publication, apply to the following AUDI models:

AUDI 80 / AUDI 4000 USA/California,
with 2.0 l / 4-cyl. engine, 83 kW
Engine code letters 3A, Year of manufacture 09.87->

KE-Motronic, system version MK 1.1.

This system with common control unit has to a great extent the same functions as the KE 3-Jetronic with an EI-K ignition system. The fuel-injection unit corresponds exactly to that of the KE-Jetronic with regard to the mechanical and hydraulic parts of the system.

Alongside the basic functions of fuel injection and ignition, the system has further additional functions:

* Lambda closed-loop control with adaptive basic adaptation (automatic compensation of basic faults).
* Low-idle-speed control.
* Knock control.
* Electronically controlled tank ventilation.
* Self-diagnosis with fault memory.

SPECIAL FEATURES

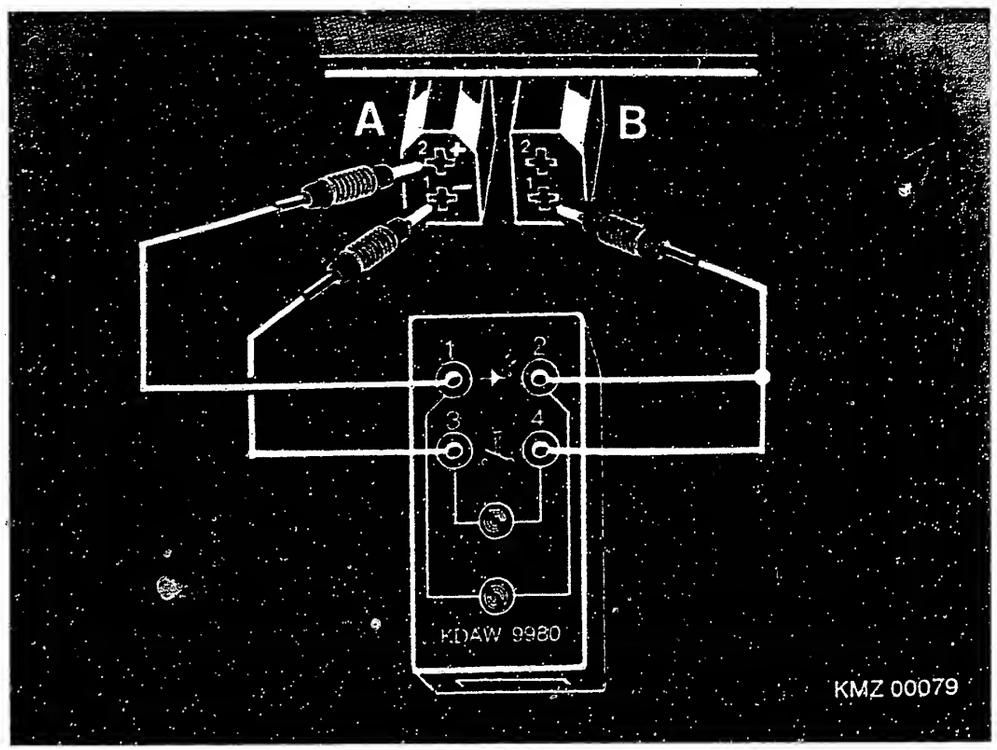
Alterations to self-diagnosis as of Model 1988:

* Activation of self-diagnosis no longer possible at fuel pump relay.

* Special test connection in area of mixture-control unit for connection of diagnosis lamp dispensed with.

For activation and evaluation of the self-diagnosis, there are two diagnosis connectors for connection of the diagnosis evaluation unit KDAW 9980 or a diode test lamp on the driver's side in the footwell above the pedals.

Refer to following coordinate for assignment of diagnosis connectors and connection of evaluation unit.



A = Black connector for voltage supply

B = Red (Model 1988) or brown (as of Model 1989) diagnosis connector. Upper connection not used.

SPECIAL FEATURES

Illustration shows arrangement and assignment of connectors and connection of diagnosis evaluation unit KDAW 9980.

N o t e :
Check arrangement of connectors and assignment if applicable, since not always in line with Fig.

There have been no changes to the self-diagnosis, fault-storage, activation-time and fault-clearance functions and these are in line with the description given in the basic microcard.

STRUCTURE AND USAGE

These brief instructions encompass essentially vehicle-specific special features and test specifications (set values).

In accordance with the customer complaint, the trouble-shooting chart leads to different causes/component faults.
For a detailed description of trouble-shooting, see the information in the trouble-shooting chart of the basic instructions.

ATTENTION: Even if reference is made to basic instructions, the set values, terminal assignments and special features of these vehicle-related brief instructions are always binding.

SAFETY AND PRECAUTIONARY MEASURES

In order to keep persons out of danger and to avoid damage to the engine, trigger boxes and control units or to the ignition system, observe the information in the basic instructions.

CAUTION!
High-performance ignition system with dangerous primary and secondary voltages!

Touching voltage-carrying components or terminals may prove fatal (both on the primary and secondary sides).

TROUBLE-SHOOTING CHART

Customer complaint (fault symptoms)

1. Starting motor operates, engine fails to start or starts only with difficulty.	2. Engine starts but then dies.	3. Idle problems (engine speed, exhaust gas).	4. Poor throttle take-up, flat spot during acceleration.	5. Engine missing (ignition, injection).	6. Maximum engine power/top speed not reached.	7. Fuel consumption too high.	8. Engine running on.	9. Engine pinging/knocking.	10. Engine overheating.	11. Fault lamp.	Cause (component fault)
*	*	*	*	*	*	*	*	*	*	*	Self-diagnosis
*		*	*		*						Induction system
*	*	*	*		*			*	*		Voltage supply, control unit
*	*			*	*						Electric fuel pump
*	*	*	*				*				Air-flow sensor
*		*				*					Cold-start valve
*	*			*	*						Primary pressure
*	*	*	*	*	*	*					Differential pressure
*											Fuel system leaking
*	*	*	*	*	*		*				Injection valves
*	*	*	*		*	*					Fuel distributor
*		*			*						Throttle valve
*	*	*	*		*	*					Temperature sensor (engine)
		*	*								Throttle-valve switch (idle)
					*			*	*		Throttle-valve switch (full load)
		*	*		*						Lambda closed-loop control
*	*	*	*			*					Exhaust-gas adjustment
		*									Low-idle-speed control

TROUBLE-SHOOTING CHART (CONTINUED)

Customer complaint (fault symptoms)

1. Starting motor operates, engine fails to start or starts only with difficulty.	2. Engine starts but then dies.	3. Idle problems (engine speed, exhaust gas).	4. Poor throttle take-up, flat spot during acceleration.	5. Engine missing (ignition, injection).	6. Maximum engine power/top speed not reached.	7. Fuel consumption too high.	8. Engine running on (dieseling).	9. Engine pinging/knocking.	10. Engine overheating.	11. Fault lamp.	Cause (component fault)
*											Starting enrichment
	*										Post-start enrichment
	*	*	*								Warm-up enrichment
			*								Acceleration enrichment
			*		*					*	Full-load enrichment
						*					Overrun cut-off
							*				Tank-ventilation system
*				*							Ignition high-voltage side
*				*							Ignition coil
*		*									Firing order
*											Voltage, magnetic pulse generator
*											Magn. pulse generator, operation
*											Control-unit operation, ignition
*											Voltage, trigger box
*											Primary signal
				*							Voltage, ignition coil
*											Ignition distributor - installation adjustment
*					*	*	*	*	*	*	Basic ignition setting

SELF-DIAGNOSIS TEST TABLE

Fault indication Flashing code	Testing of component/function	Test instructions/ test conditions	Terminals	Set values
1 1 1 1	Control unit	This fault is indicated by steady lighting of the diagnostic lamp while the vehicle is being driven. Exchange control unit without any further testing.	— —	— —
2 1 1 3	Magnetic pulse generator defective or open circuit between control unit and magnetic pulse generator	Engine cannot be started. Switch on ignition. Voltage measurement at cable connector of ignition distributor: Test sensor signal (idle speed):	3 1 (+)(-) 2 1	at least 10 V Rectangular pulse
	Air-flow sensor plate sticks in rest position	It may be possible to start the engine. Check centring and freedom of movement of air-flow sensor plate.	— —	— —
2 1 2 1	Idle-speed throttle-valve switch or lead defective	Idle-speed throttle-valve switch constantly closed. Lead to ECU terminal 28 is short-circuited to ground. Switch setting incorrect. Resistance measurement at plug: throttle valve closed: throttle valve open : Setting of switching point:	1 2	Approx. 0 Ω Infinity Ω 0.15 ... 0.5 mm
2 1 2 3	Full-load throttle-valve switch or lead defective	Full-load throttle-valve switch constantly closed. Lead to ECU terminal 31 is short-circuited to ground. Setting incorrect. Resistance measurement at plug: throttle valve closed: throttle valve open : Setting of switching point:	2 3	Infinity Ω Approx. 0 Ω 8 ... 12° before full load

SELF-DIAGNOSIS TEST TABLE (CONTINUED)

Fault indication Flashing code	Testing of component/function	Test instructions/ test conditions	Termin-als	Set values
2 1 4 1	Knock-control limit reached.	As engine knock occurs, spark-advance angle is retarded by a specific amount and then subsequently advanced again slowly. Diagnostic lamp lights during the period of maximum retardation. Check basic ignition setting and correct if necessary. Test specification: Setting: Idle adjustment incorrect. Further possible causes: fuel quality, shielded lead of knock sensor damaged, engine damage.	 — — — —	 4...8° before TDC 5...7° before TDC
2 1 4 2	Knock sensor defective or open circuit in lead or contact resistance	Fault detection as of an engine speed of approx. 2650min $^{-1}$. After time lag, a steady lighting of diagnostic lamp until engine is switched off. Check leads from control unit to knock-sensor plug-in connection for open circuit: Check cable connector of knock sensor for short circuit to ground: Tightening torque, knock sensor:	 6 1 8 2 8 3 1 2 — —	 Approx. 0 Ω Approx. 0 Ω Approx. 0 Ω Infinity Ω 15...25 Nm
2 2 3 1	Low-idle-speed control not within the operating range	Possible causes: Basic adjustment of throttle valve. Induction system (e.g. unmetered air). Basic ignition setting incorrect.	— —	— —

SELF-DIAGNOSIS TEST TABLE (CONTINUED)

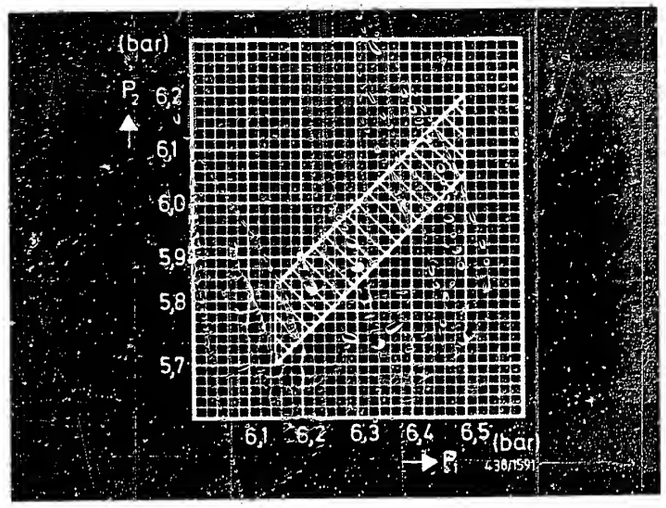
Fault indication Flashing code	Testing of component/function	Test instructions/ test conditions	Terminals	Set values
2 2 3 2	Potentiometer in air-flow sensor defective or open circuit in lead	Voltage measurements at cable connector of potentiometer (with auxiliary leads). Switch on ignition. Supply: Signal (deflect air-flow sensor plate): Disconnect control-unit plug and test leads 35, 23 and 26 to plug of potentiometer for: * Open circuit: * Short circuit to ground:	 1 3 2 3 (+) (-) 35 3 23 2 26 1 8,23,26	 4.35 ... 5.35 V Voltage increase Approx. 0 Ω Approx. 0 Ω Approx. 0 Ω Infinity Ω
2 3 1 2	Temperature sensor (engine) or lead defective	Check resistance value at temperature sensor (NTC): Engine cold (+15 ...+30° C): Engine at normal operating temperature (+80°C): Check leads from control unit to NTC for: * Open circuit: * Short circuit to ground:	 — — — — 3-NTC 8-NTC 3, 8	 1300...3600 Ω 250... 390 Ω Approx. 0 Ω Approx. 0 Ω Infinity Ω
2 3 4 1	Lambda closed-loop control not within operating range (control limits exceeded or fallen below)	Fault occurs only in idle/part-load range. Indicated by diagnostic lamp if fault has been present for at least 2 minutes. Possible causes of trouble: * Lambda closed-loop control not or incorrectly functioning, short circuit in sensor lead, lambda-sensor heater defective. * Cold-start valve leaking. * Induction system leaking (unmetered air). * Tank-ventilation valve constantly open. * Idle adjustment incorrect.	— —	— —

SELF-DIAGNOSIS TEST TABLE (CONTINUED)

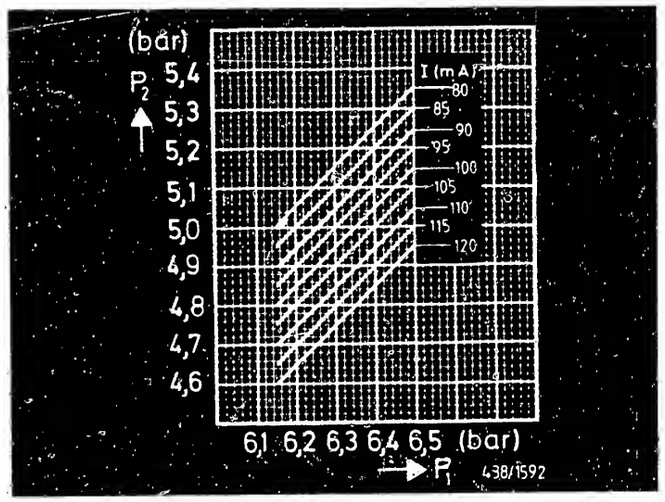
Fault indication Flashing code	Testing of component/function	Test instructions/ test conditions	Termin-als	Set values
2 3 4 2	Lambda sensor or sensor lead defective	Fault is detected when engine at normal operating temperature and in range between idle and approx. 3500 min $^{-1}$ and is indicated by diagnostic lamp. * Resistance value of lambda sensor. Cold: Hot: * Test for open circuit in lead:	7-grnd " 7	> 20 k Ω < 2 k Ω Approx. 0 Ω
2 3 4 3	Fuel mixture too lean (mixture control limit +10 mA exceeded).	Possible causes: * Induction system leaking (unmetered air). * Idle adjustment too lean.	— —	— —
2 3 4 4	Fuel mixture too rich (mixture control unit -5 mA fallen below).	Possible causes: * Cold-start valve leaking. * Idle adjustment too rich.	— —	— —
4 4 3 1	Low-idle-speed control not functioning	Possible causes: * Voltage supply (ignition term. 15) to idle actuator term. 2 open-circuited: * Open circuit in lead from control unit term. 17 to idle actuator term. 1 or short circuit to ground. Continuity: Short circuit to ground: * Idle actuator defective (open circuit): * Control unit defective, replace.	2-grnd 17 2 17-grnd 1 2	Battery voltage Approx. 0 Ω Infinity Ω 4...12 Ω
4 4 4 4	No fault detected	——— ———	— —	— —

TEST SPECIFICATIONS

NO.	Testing/Test condition	Set value	
1	Electric fuel pump – fuel delivery: Supply voltage (under load):	At least 1000 cm ^{3} /min At least 11,5 V	
2	Primary pressure:	6,15...6,5 bar	
3	Differential pressure: Take lower-chamber-pressure "warm" set value corresponding to the primary pressure measured from the top chart (actuator current 0 mA) Take lower-chamber-pressure "cold" set value corresponding to primary pressure and actuator current measured from bottom chart (tolerance ± 0.15 bar) Simulation of "cold" condition: Switch on ignition (peak coil current approx. 100 mA).		
4	Rate of flow, KE restriction:	130...150 cm ^{3} /min	
5	Leakage test – complete system: Minimum pressure after 10 mins: Minimum pressure after 20 mins:	 3,3 bar 3,2 bar	
6	Injection valves – opening pressure:	3,7...4,8 bar	
7	Fuel distributor – comparative measurement of fuel deliveries Actuator current 0 mA: Idle: Part load: Full load: Minimum delivery at max. deflection of air-flow sensor plate:	Setting (cm ^{3} /min) 6,0 40,0 100,0 120...150 cm ^{3}	Max. permiss. delivery (cm ^{3} /min) 6,6 42,5 109,0
8	Air-flow sensor plate – zero position (under basic position):	1,9...3,0 mm	
9	Air-flow sensor plate – travel:	0,1...2,0 mm	



p 1 = Primary pressure
p 2 = Lower-chamber pressure
I = Actuator



TEST SPECIFICATIONS (CONTINUED)

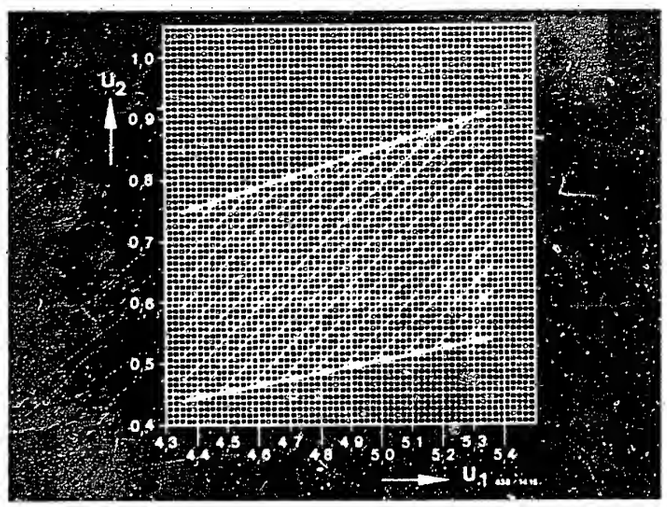
No.	Testing/Test condition	Set value
10	Idle-mixture-adjusting screw - basic setting dimension:	18,7...18,9 mm
11	Throttle-valve switch - switching-point settings: Idle switch - clearance, lever to stop: Full-load switch - switching point before full-load stop:	 0,15...0,5 mm 8... 12°
12	Resistance value, cold-start valve:	6...14 Ω
13	Resistance value, idle actuator:	4...12 Ω
14	Resistance value, tank-ventilation valves (both):	35...55 Ω
15	Resistance value, pressure actuator:	16...22 Ω
16	Resistance value, lambda-sensor heater:	1...15 Ω
17	Resistance value, fuel-temperature sensor (NTC): Engine cold (+15°C ... +30°C): Engine at norm. op. temp. (approx. +80°C):	 1300...3600 Ω 250... 390 Ω
18	Potentiometer in air-flow sensor (basic function) Supply voltage: Volt. signal; air-flow sensor plate in netral pos.: Voltage signal; air-flow sensor plate deflected: Check potentiometer setting if necessary:	 4,35...5,35 V 0...0,2 V Voltage increase See test specification No. 30
19	Test control-unit functions - injection unit: Peak coil current: Starting enrichment - engine at normal operating temperature: Post-start enrichment (corresp. to +20°C): * Start engine. Current value: * Current value constant for: * Afterwards, slow regulation to: Warm-up enrichment (corresp. to +20°C), lambda sensor disconnected, idle speed:	 85...115 mA 55... 65 mA 15... 23 mA 3... 6 s 9... 11 mA 9... 11 mA

TEST SPECIFICATIONS (CONTINUED)

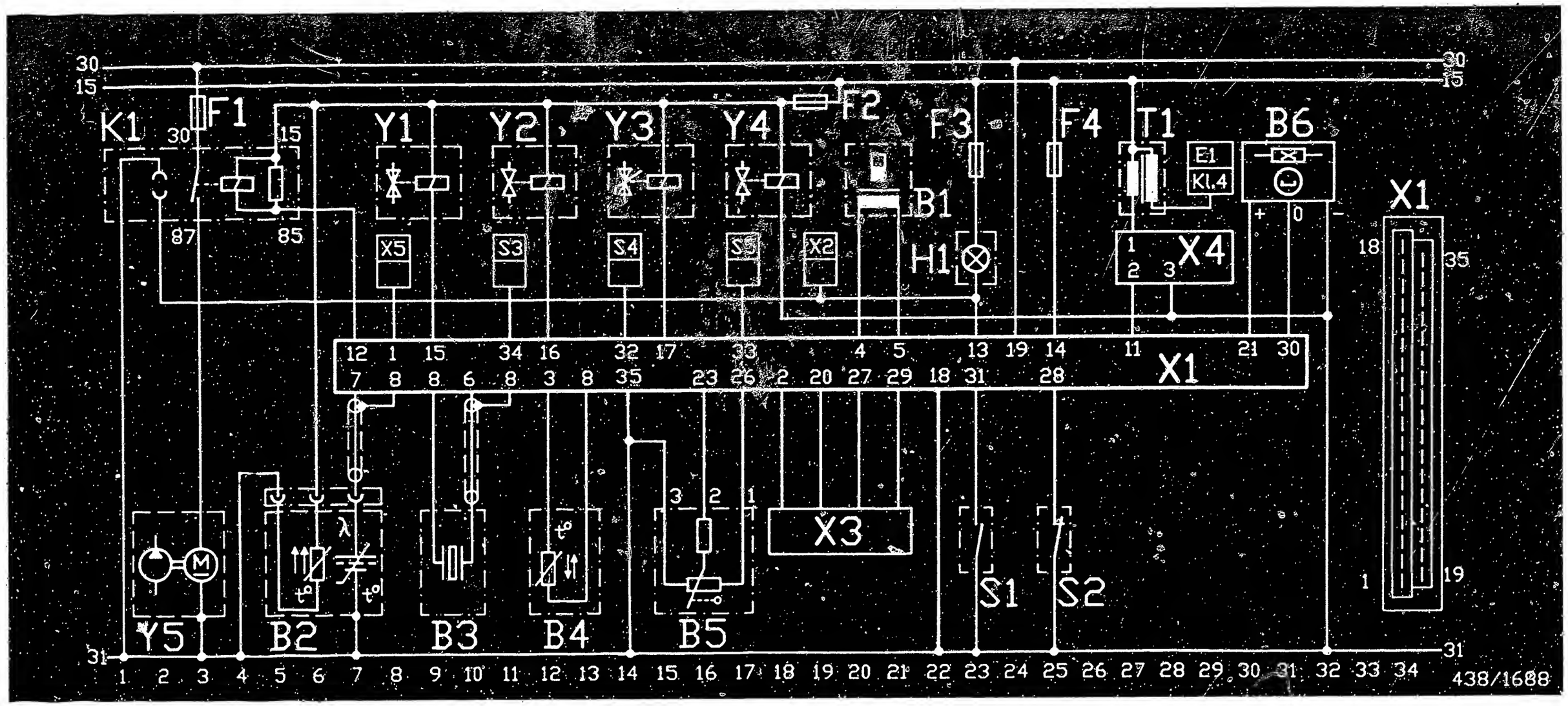
No.	Testing/Test condition	Set value
	Test control-unit functions – injection unit (continued):	
	Acceleration enrichment (corresp. to +20°C):	Current increase
	Full-load enrichment (engine at norm. op. temp.):	2...5 mA
	Overrun cut-off (engine at norm. op. temp.):	–40...–80 mA
20	Lambda closed-loop control:	
	Open-loop-control operation Switch off ignition. Disconnect negative terminal from battery and reconnect after 1 minute (this serves to clear memory). Disconnect lambda sensor. Start engine:	–1...+1 mA (static)
	Rich stop (sensor lead to ground) (heavily over-enriched, engine may stall):	Max. 23 mA
	Lean stop (sensor lead to 1.5 V) (excessively lean, engine may stall):	Max. –16 mA
	Closed-loop-control op. (lambda sensor connected):	0...5 mA (pulsating)
21	Resistance value, lambda sensor. Cold: Hot:	> 20 k Ω < 2 k Ω
22	Ignition coil – resistance values: Primary: Secondary	0,6...1,0 Ω 6,4...11,1k Ω
23	Control-unit function – ignition at idle speed:	Rectangular pulse
24	Voltage supply, trigger box (output stage):	Battery voltage
25	Voltage supply, ignition coil under load:	At least 10 V
26	Ignition – basic setting: Test specification: Setting:	4...8° before TDC 5...7° before TDC

TEST SPECIFICATIONS (CONTINUED)

No.	Testing/Test condition	Set value
27	Knock sensor – tightening torque:	15...25 Nm
28	Firing order:	1 – 3 – 4 – 2
29	Idle adjustment: Test and setting conditions: * First of all eliminate all faults detected by self-diagnosis. * Exhaust system between cylinder head and catalytic converter must be absolutely leak-tight * Basic ignition setting O.K. * If resetting necessary: remove closure cr from activated-carbon canister, pull off crankcase hose from cylinder head and breather housing and seal off. Idle-speed check value (not adjustable): Speed increase with air conditioner "on" by: CO check value (not adjustable): Pressure-actuator activation current in closed-loop control operation	 780...900 min $^{-1}$ Approx. 70 min $^{-1}$ 0,3...1,2 by vol. % 0...5 mA
30	Signal of potentiometer in air-flow sensor (measurement necessary only if poor idle or part-load performance): Measure supply voltage at potentiometer term. 1 (+) and 3 (–) and note down: Measure voltage signal of potentiometer at term. 2 (+) and 3 (–) with engine at normal operating temperature and at idle speed and compare with chart opposite.	 4,35...5,35 V See chart



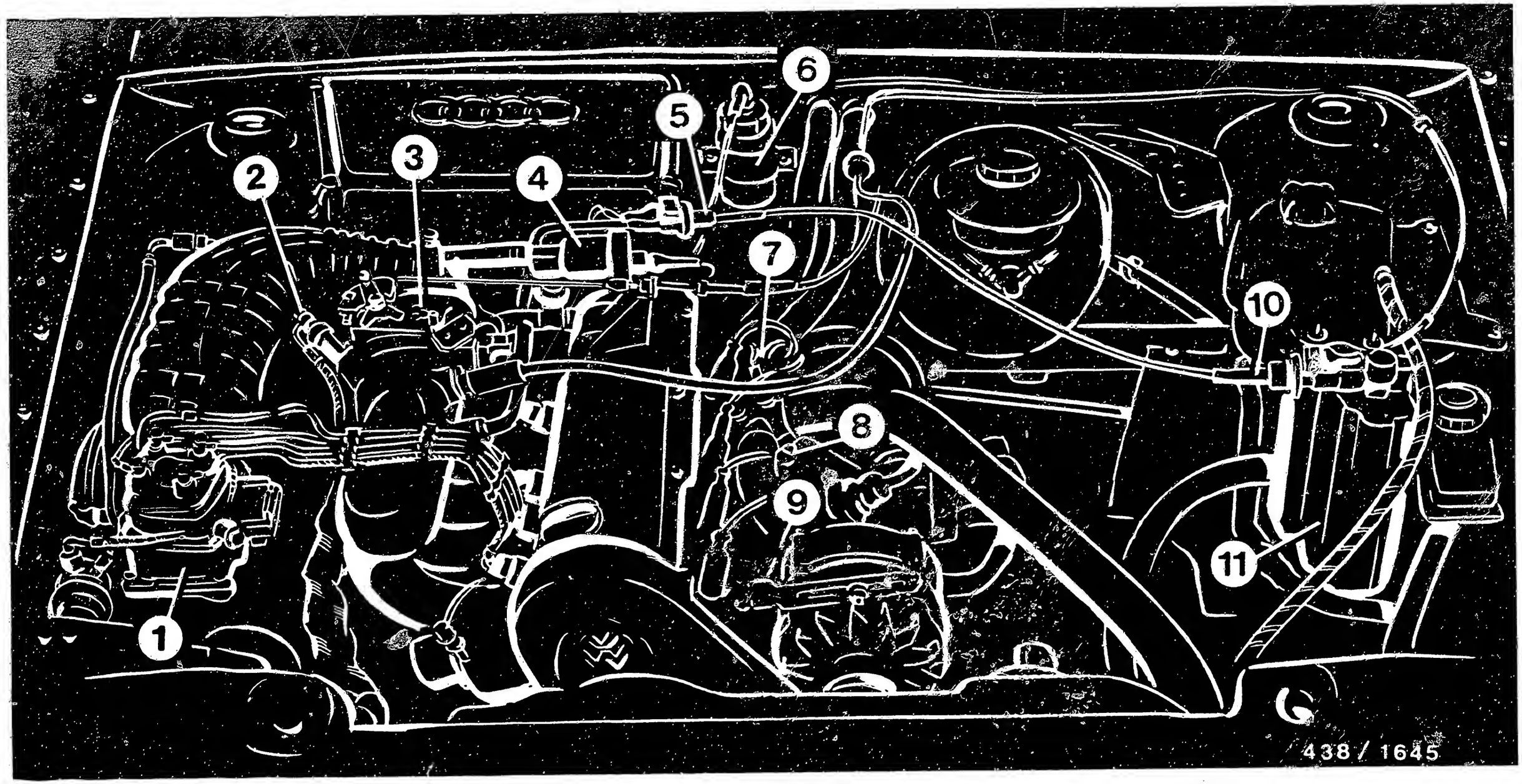
U_1 = Supply voltage, potentiometer
U_2 = Potentiometer voltage signal



B1 = Pressure actuator
B2 = Lambda sensor
B3 = Knock sensor
B4 = Temperature sensor (engine)
B5 = Air-flow-sensor potentiometer
B6 = Hall generator
E1 = Ignition distributor
F1 = 15 A fuse
F2 = 15 A fuse
F3 = 15 A fuse
F4 = 10 A fuse
H1 = Diagnostic lamp (California model only)
K1 = Electric-fuel-pump relay with contacts for triggering diagnosis
S1 = Throttle-valve switch (full load)
S2 = Throttle-valve switch (idle)
S3 = Connection, transmission switch (in vehicles (with man. shifted transm. to ground)
S4 = Connection, air-conditioner readiness
S5 = Connection, air-conditioner compressor
T1 = Ignition coil with ignition trigger box
X1 = Plug, KE control unit
X2 = Test connection, diagnosis (not California model)
X3 = Plug, parameter encoder
X4 = Plug, ignition trigger box
X5 = Connection, diagnosis interface
Y1 = Tank-ventilation valve
Y2 = Cold-start valve
Y3 = Idle actuator
Y4 = Tank-ventilation switch. valve
Y5 = Electric fuel pump

ELECTRICAL TERMINAL DIAGRAM

C25 ⟹ C26 ⟸



1 = Mixture-control unit
2 = Start valve
3 = Throttle-valve assembly with throttle-valve switch, full load (top) and idle (bottom, not visible in picture)
4 = Idle actuator
5 = Switching valve for tank ventilation
6 = Ignition coil with trigger box, output stage
7 = Ignition distributor
8 = Temperature sensor (engine)
9 = Knock sensor, on engine block, covered by alternator
10 = Tank ventilation valve (pulsed)
11 = Activated carbon filter

INSTALLATION POSITION OF COMPONENTS

INSTALLATION POSITION OF COMPONENTS (CONTINUED)

* Injection valves:
  Inserted into the locating bores of the intake-manifold flanges and secured in pairs by mountings.

* KE-Motronic control unit:
  Above the footwell on the passenger's side between bulkhead and ventilation duct.

  Removal: remove trim in front of glove compartment. Push latching peg toward bulkhead and pull control unit out downwards.

* The fuel-supply components, electric fuel pump, fuel accumulator, and fuel filter:
  On the vehicle underbody on the right in the area in front of the rear axle.

* Catalytic converter and lambda sensor:
  In the exhaust system in the area behind the front axle.

When loosening and tightening joints and connections in fuel lines, make sure everything is clean and counterhold at the fixed hexagon of the respective component.

When connecting electrical cable connectors, make sure they are connected properly and spring clips are latched in tightly.

For production reasons:
continued on the following coordinate.

Trouble-shooting instructions : ALL-5000

BOSCH system : Alarm system 20c, 20s

Make of vehicle : General

Basic microcard : KFZ-012

TABLE OF CONTENTS

SPECIAL FEATURES

This microcard, valid at the time of publication, contains trouble-shooting instructions for the following alarm system:

Auto Alarm 20c, 20s with trigger boxes
0 335 411 031, 033 also in combination with:

* Auto Alarm Plus 3 (wheel protection)
* Auto Alarm Plus 4 (passenger-compartment protection)
* Priming indicator (LED)

IMPORTANT:
Leads of ultrasonic sensor and anti-tow safeguard must not be extended and must not be laid in parallel.

STRUCTURE, USAGE

These brief instructions essentially comprise vehicle-specific special features and test specifications (set values).

In line with the customer complaint, the trouble-shooting chart leads to various causes/component faults.
A detailed description of trouble-shooting is given in the trouble-shooting chart in the basic instructions.
NOTE: Even if reference is made to basic instructions, the set values, terminal assignments and special features indicated in these vehicle-specific brief instructions are always binding.

SAFETY AND PRECAUTIONARY MEASURES

As a general rule alarm systems are maintenance-free. Attention must be paid to the following when working on vehicles with an alarm system fitted.

* Detach plug of electronic trigger box when carrying out welding work using electric welding equipment.
* When performing painting work, the electronic trigger box may be subjected to max. + 95° C for brief periods and max. +85° C for long periods (approx. 2 hours).
* Make sure battery terminals are properly tightened at terminal posts of battery.
* Do not use a fast charger to start engine.
* Never disconnect battery from vehicle electrical system with engine running.
* Detach battery from vehicle electrical system when carrying out fast charging.
* Do not detach or attach wiring-harness plugs of trigger boxes with ignition switched on.

TEST PREREQUISITES

* Alarm system installed as per installation instructions.
* All plug contacts O.K.
* Spring contacts in plugs engaged.

TROUBLE-SHOOTING CHART

Customer complaint (fault symptoms)

The fault characteristics outlined below may be due to one or more faults.

1. False alarm with Auto Alarm 20c, 20s following installation with system primed	2. False alarm with Auto Alarm 20c, 20s after system has already been functioning properly for some time.	3. No alarm with Auto Alarm 20c, 20s. Alarm system 20c primed by way of encoding switch or 20s by way of key-operated switch	Cause (component fault)
X			Circuit fault on installation of system, door contacts must not be connected to S- and S1-
X			Contact switches of hood and trunk lid are not connected to S- and S1-
X	X		Positive or negative fan motor incorrectly connected
	X		Loose contact in ground lead of load routed via terminal E of alarm relay
	X	X	Short circuit or short to ground between leads
		X	Contact switch, leads or fuse defective
		X	Interior lamp on: power supply of alarm relay interrupted; alarm relay, alarm relay, encoding switch, key-operated switch or alarm horn defective.

TROUBLE-SHOOTING CHART (CONTINUATION 1)

Customer complaint (fault symptoms)

The fault characteristics indicated below may be caused by one or more faults.

4. No alarm in the case of Auto Alarm 20c, 20s, alarm system 20c primed with encoding switch or 20s with key-operated switch.

5. No alarm in the case of Auto Alarm 20c and 20s with additional Auto Alarm Plus 3 (wheel protection). Alarm system primed.

6. No alarm in the case of Auto Alarm 20c and 20s with additional Auto Alarm Plus 4 (passenger compartment protection). Alarm system primed.

7. Sudden alarm in the case of Auto Alarm 20c or 20s with Auto Alarm Plus 4 and auxiliary heating.

4	5	6	7	Cause (Component fault)
X				If engine compartment or trunk lighting O.K., fault is to be found in alarm relay or lead
X				Short circuit or short to ground in contact switch or lead to connected load
	X			Plug connections dropped off at alarm relay or angle encoder
	X			Encoding switch, key-operated switch, wheel protection or angle encoder defective
		X		Encoding switch, key-operated switch or ultrasonic detector defective
			X	Movement of air in passenger compartment due to start-up of auxiliary heating

TROUBLE-SHOOTING CHART (CONTINUATION 2)

Customer complaint (fault symptoms)

The fault characteristics indicated below may be caused by one or more faults.

8. Auto Alarm System 20c cannot be primed with encoding switch or cannot be switched off during alarm situation.

9. Auto Alarm System 20s cannot be primed with key-operated switch or cannot be switched off during alarm situation.

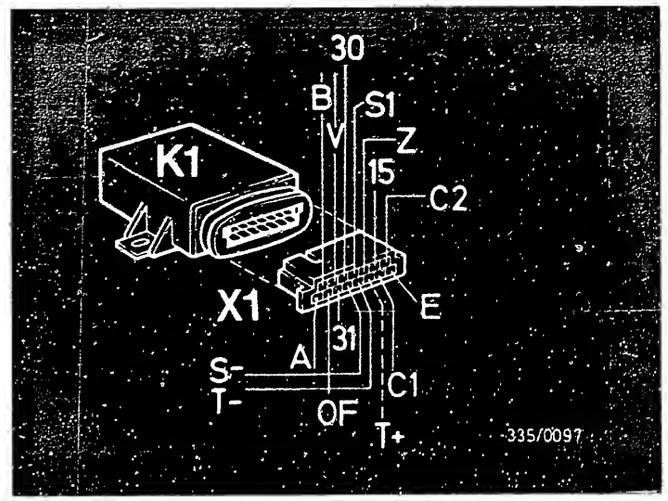
10. Sudden alarm in the case of Auto Alarm 20c or 20s without Alarm Plus 4 and auxiliary heating.

8	9	10	Cause (component fault)
X			Encoding switch defective or open circuit in leads
	X		Key-operated switch defective
		X	Run-out of heating-blower motor acts as generator. Trigger box detects voltage via term. 15 and triggers alarm.
X	X	X	Alarm relay defective

RAPID DIAGNOSIS CHART

Component installed in vehicle (trigger box 0 335 411 031, 033)

Test step	Testing of component / function Test instructions/conditions	Term.	Set values
1	Supply voltage term. 30, ignition off, vehicle stopped	30	greater than/ equal to 10 V
2	Supply voltage term. 15, ignition on, vehicle stopped	15	greater than/ equal to 10 V
3	Supply voltage, relay contact for alarm horn actuation	B	greater than/ equal to 10 V
4	Ignition off. Prime system with encoding switch or key-operated switch. If auxiliary units such as "Plus 3 or Plus 4" are connected (voltage measurement). With trigger box 0 335 411 033 If auxiliary units not connected (resistance measurement).	Z	primed < 2.7 V deprimed > 10 V primed < 2.0 V primed < 1 k Ω deprimed > 1 M Ω
5	AS primed: door closed door open Alarm must sound immediately on opening door.	T+	approx. 0 V greater than/ equal to 10 V
6	AS primed: door closed door open Alarm must sound immediately on opening door.	T-	greater than/ equal to 10 V approx. 0 V
7	AS primed: trunk lid closed open trunk lid Alarm must sound immediately on opening.	S-	greater than / equal to 10 V approx. 0 V



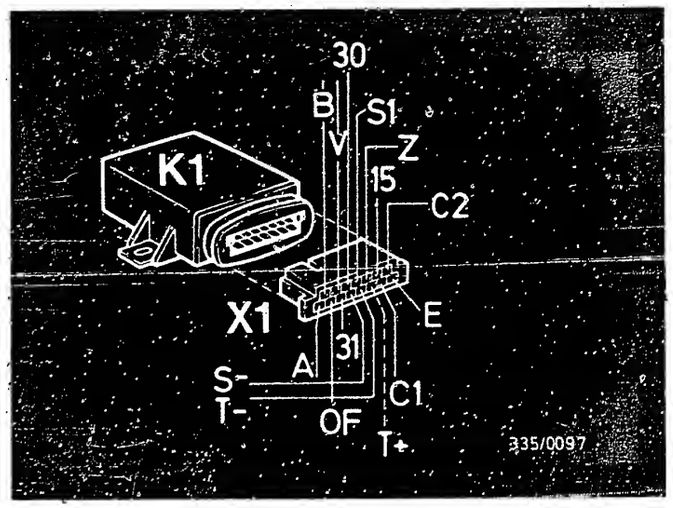
K1 = Alarm relay
X1 = Plug, alarm relay

Connections:
A = Alarm horn B1
B = Fuses, term. 30
C1 = Alarm delay 5...8s
C2 = Alarm delay 10 ... 14s
E = Encoding switch or key-operated switch
OF = not used
S- = Trunk switch
S1- = Engine compartment switch
T+ = Door contact switch positive switching
T- = Door contact switch negative switching
V = Relay K2, term. 85
Z = not used
15 = Ignition/starting switch S2, term. 15
30 = Fuses, term. 30
31 = Vehicle ground

RAPID DIAGNOSIS CHART (CONTINUATION 1)

Component installed in vehicle (0 335 411 031, 033)

Test step	Testing of component / function Test instructions/conditions	Term.	Set values
8	AS primed: hood closed open hood Alarm must sound immediately on opening.	S1–	greater than/ equal to 10 V approx. 0 V
9	If no relay is externally connected (resistance measurement) If relay is externally connected (voltage measurement)	V	primed > 1 M Ω deprimed approx. 0 Ω primed > 10 V deprimed < 2.7 V
10	Irrespective of whether AS is primed or deprimed, detach electrical connection at E or short-circuit. It must only be possible to switch alarm off again with encoding switch or key-operated switch.	E	Alarm must sound immediately
11	AS primed, trigger alarm by opening door Use analog multimeter	A	less than 6 V greater than 10 V intermittent
12	AS primed, trigger alarm by opening door Use analog multimeter with relay	OF	less than 6 V greater than 10 V intermittent
13	Ground connection from alarm relay to vehicle ground	31	approx. 0 Ω
14	Ground connection from alarm relay to vehicle ground, if present	C1	approx. 0 Ω
15	Ground connection from alarm relay to vehicle ground, if present	C1	approx. 0 Ω



K1 = Alarm relay
X1 = Plug, alarm relay

Connections:
A = Alarm horn B1
B = Fuses, term. 30
C1 = Alarm delay 5...8s
C2 = Alarm delay 10 ... 14s
E = Encoding switch or key-operated switch
OF = not used
S– = Trunk switch
S1– = Engine compartment switch
T+ = Door contact switch positive switching
T– = Door contact switch negative switching
V = Relay K2, term. 85
Z = not used
15 = Ignition/starting switch S2, term. 15
30 = Fuses, term. 30
31 = Vehicle ground

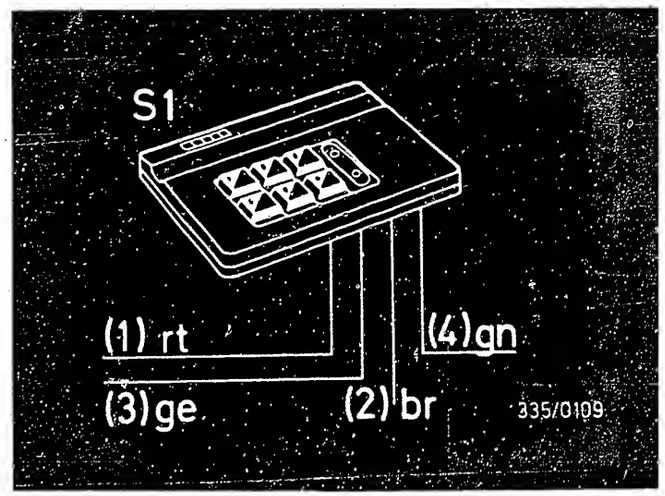
Rapid diagnosis chart

Encoding switch 0 986 333 012 only in conjunction with alarm relay 0 335 411 031, 033 installed in vehicle

Test step	Testing of component / function Test instructions/conditions	Term.	Set values
1	Supply voltage, encoding switch (red) Ignition off.	30	greater than/ equal to 10 V
2	Ground connection, encoding switch (brown)	31	approx. 0 Ω
3	Signal line to encoding switch (yellow) Measure with analog multimeter Prime AS, LED flashes for approx. 3 s. Deprime AS, LED lights up for approx. 3 s.	E	 approx. 3...4V approx. 6 V
4	Priming interlock (green) With voltage applied to D+, it must no longer be possible to prime alarm system. AS deprimed	D+	 greater than 2.5 V

Key-operated switch 0 342 006 006 in conjunction with alarm relay 0 335 411 031, 033 installed in vehicle

Test step	Testing of component / function Test instructions/conditions	Term.	Set values
1	Mechanically move key-operated switch: AS primed AS deprimed	E	 2.4 k Ω 4.8 K Ω

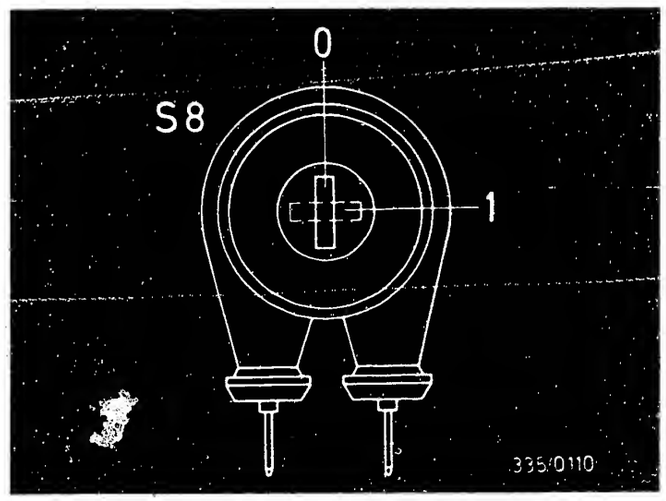


S1 = Encoding switch

Connections:
1 = red lead to term. 30
2 = brown lead to ground
3 = yellow lead to alarm relay, term. E
4 = green lead to term. 15

S8 = Key-operated switch

0 = AS deprimed
1 = AS primed



TEST SPECIFICATIONS

Auto Alarm 20c

* Battery voltage			10...13 V
* Priming delay			25...45 s
* Alarm time	audio		25...30 s
	visual	less than	4 min.
* Response time	option of		5... 8 s
			10...14 s

Auto Alarm 20s

* Battery voltage			10...13 V
* Priming delay			25...45 s
* Alarm time	audio		25...30 s
	visual	less than	4 min.
* Response time	option of		5... 8 s
			10...14 s

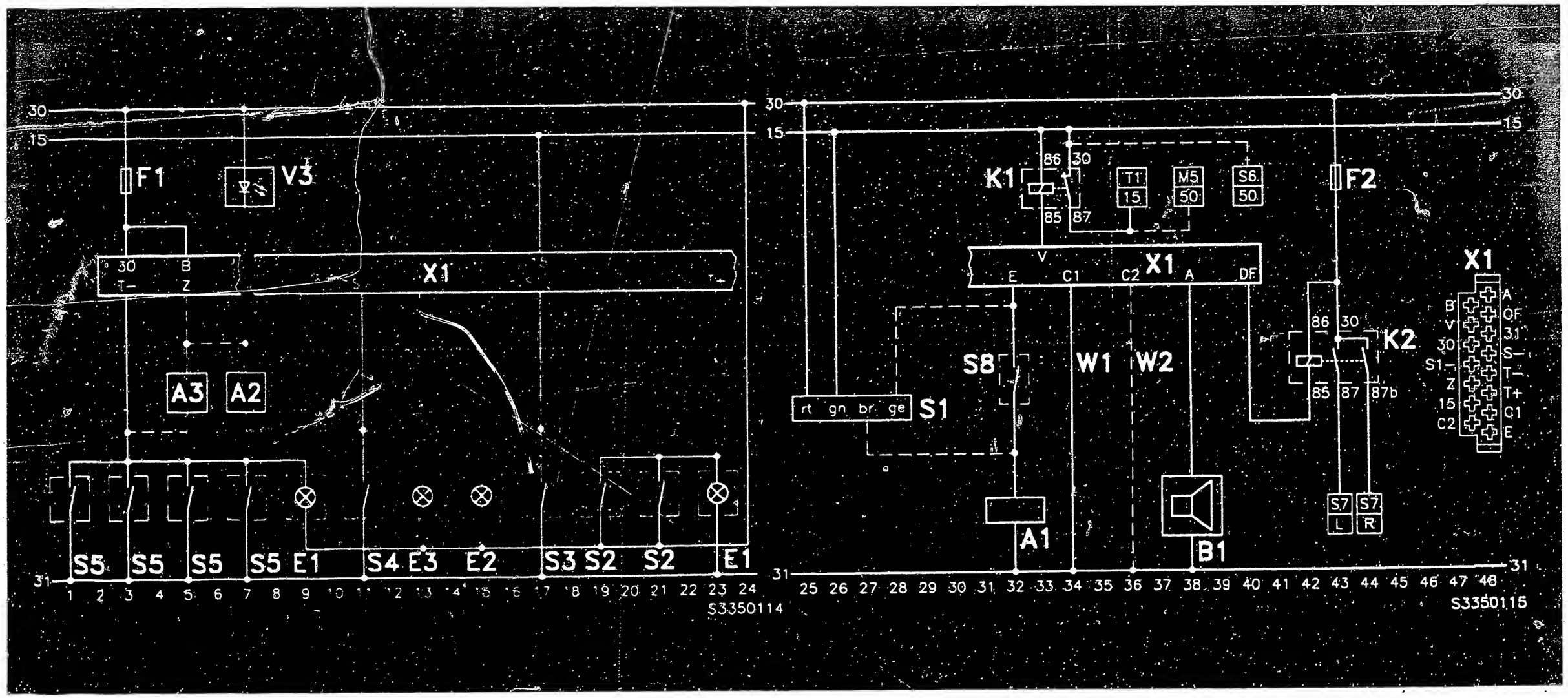
Auto Alarm Plus 3

* Battery voltage			9...13 V
* Adjustment time of angle encoder		approx.	45...55 s
* Response time		approx.	1... 2 s

Auto Alarm Plus 4

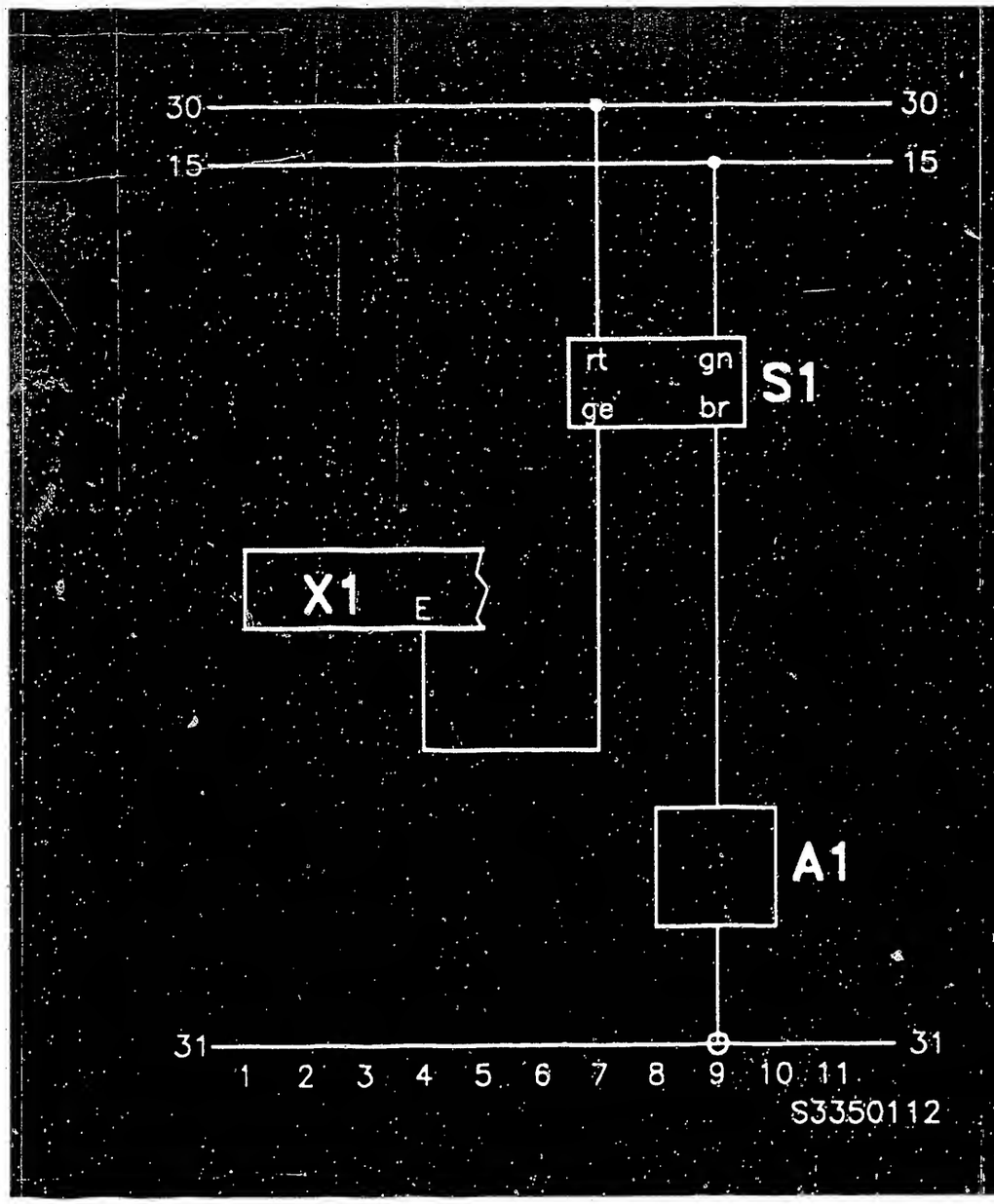
* Battery voltage			10...13 V
* Priming delay			25...45 s
* Alarm time	audio		25...30 s
	visual	less than	4 min.
* Response time option of			6...10 s
or			11...16 s

For production reasons:
continued on the following
coordinate.



ELECTRICAL TERMINAL DIAGRAM

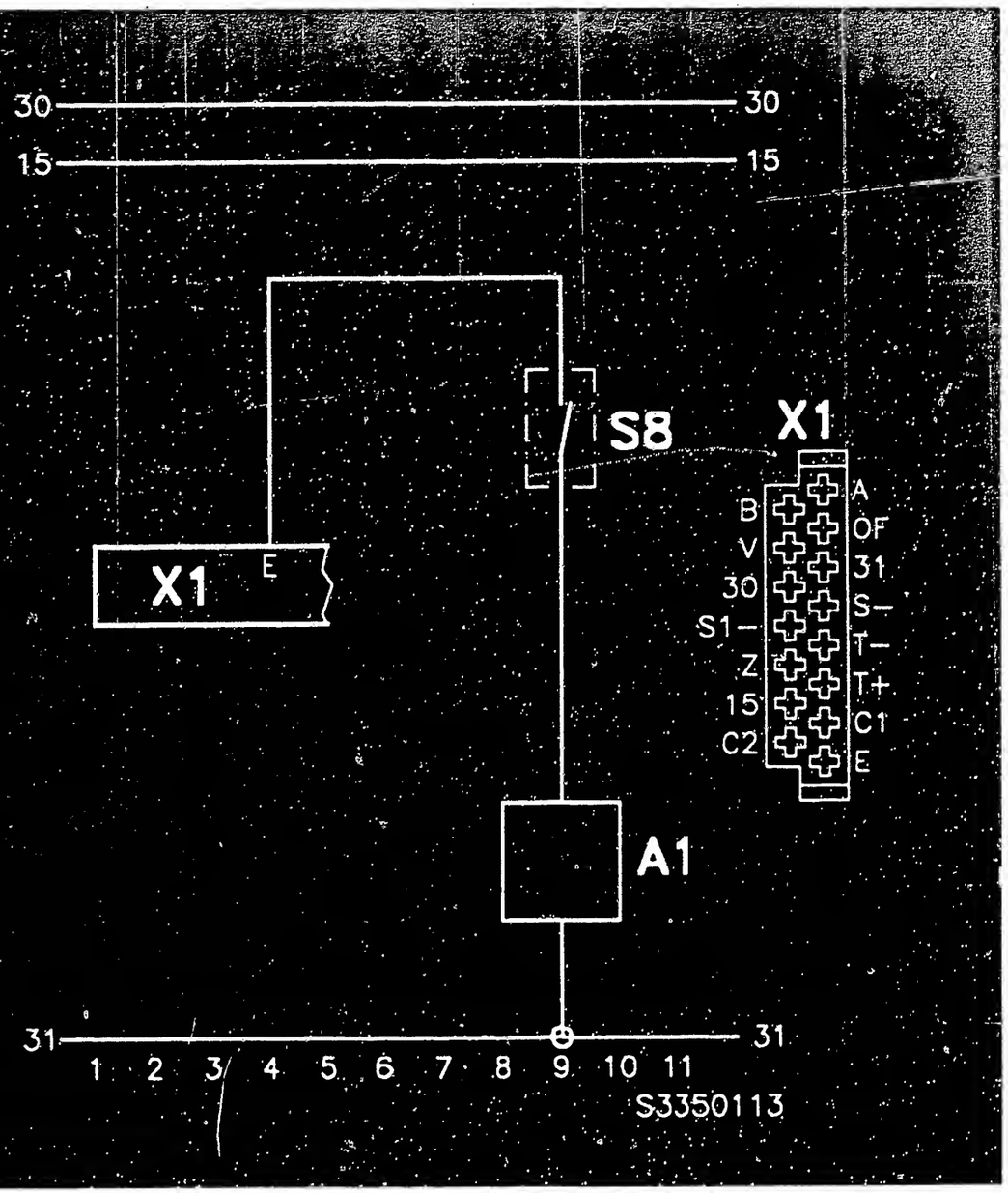
A1 = Car radio
A2 = Auto Alarm "Plus 3"
A3 = Auto Alarm "Plus 4"
B1 = Alarm horn
E1 = Interior lamp, front
E2 = Engine compartm. light
E3 = Trunk light
F1, F2 = Fuses 8A
K1 = Relay for ignition/ starting disable
K2 = Relay for visual alarm
M5 = Starting motor
S1 = Encoding switch
S2 = Door contact switch, positive switching
S3 = Engine compartment switch
S4 = Trunk switch
S5 = Door contact switch, negative switching
S6 = Ignition/starting switch
S7 = Turn-signal switch
S8 = Key-operated switch
T1 = Ignition coil
V3 = Priming indicator LED
W1 = Encoding lead 1 (5...8 s)
W2 = Encoding lead 2 (10...14 s)
X1 = Plug, alarm relay
br = brown
gn = green
ge = yellow
rt = red



BASIC CIRCUIT FOR ENCODING SWITCH

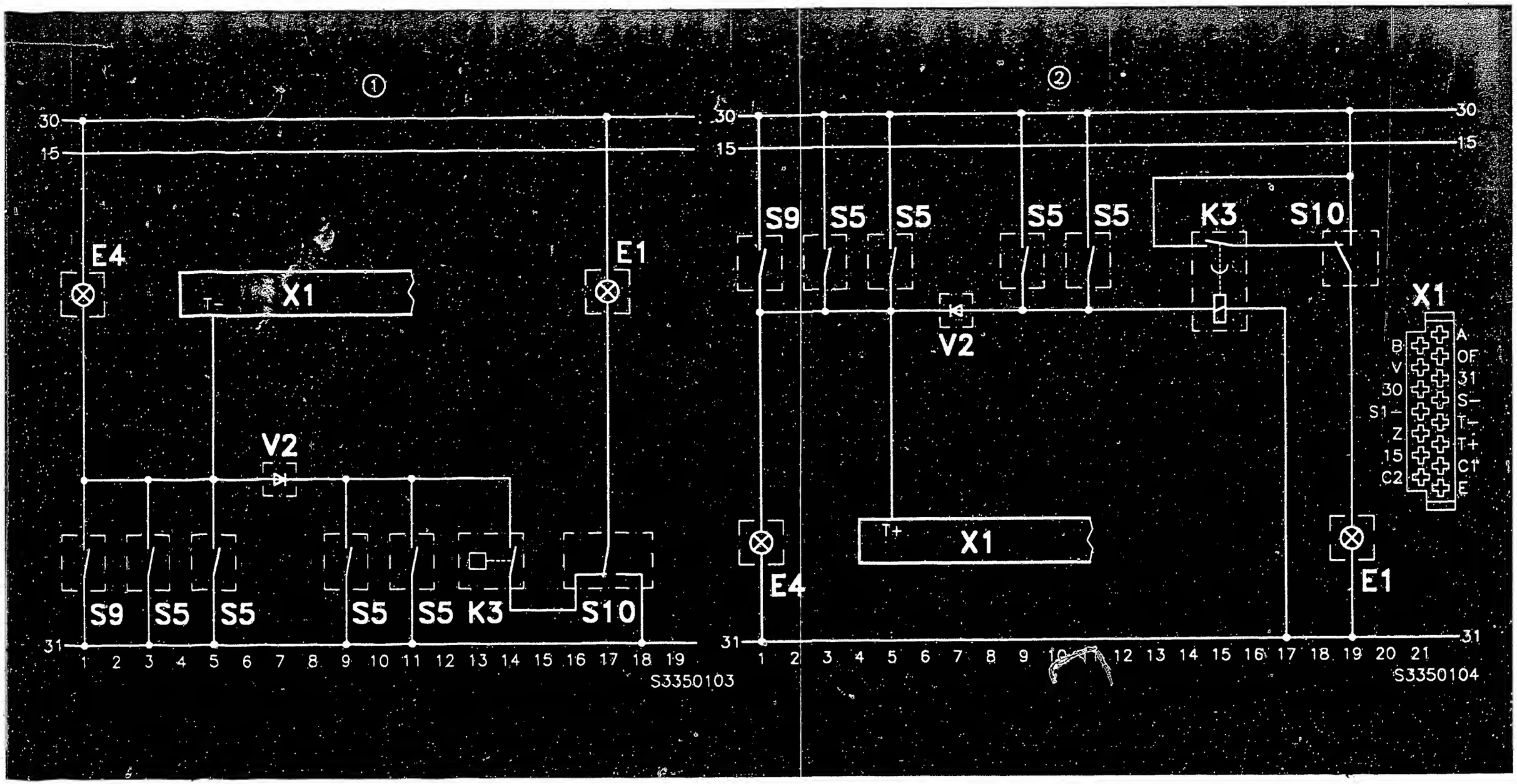
A1 = Car radio
S1 = Encoding switch
X1 = Plug, alarm relay

rt = red
br = brown
ge = yellow
gn = green



BASIC CIRCUIT FOR KEY-OPERATED SWITCH

A1 = Car radio
S8 = Key-operated switch
X1 = Plug, alarm relay



SPECIAL CIRCUITS FOR REAR INTERIOR LAMP

1 = Door contact switch, neg. switching | 2 = Door contact switch, pos. switching

E1 = Interior lamp, front
E4 = Interior lamp, rear
K3 = Time-lag relay
S5 = Door contact switch
S9 = Switch for interior lamp, rear
S10 = Switch in interior lamp, front
V2 = Blocking diode
X1 = Plug, alarm relay

INSTALLATION POSITION OF COMPONENTS

* Install alarm relay in passenger compartment at arbitrary location (e.g. beneath instrument panel) with connections downwards.

* Attach encoding switch in passenger compartment at arbitrary location offering ease of access.

* Priming indicator (LED) at readily visible location in passenger compartment.

* Key-operated switch can be fitted by means of selectable time delay to alarm relay in interior of vehicle or at arbitrary location on outside of vehicle.

* Ultrasonic sensor in passenger compartment. Above rear-view mirror or in centre of instrument panel.

* Anti-tow safeguard in passenger compartment or trunk.

For production reasons: continued on the following coordinate.

T A B L E O F C O N T E N T S

Trouble-shooting instructions : OPE-518

BOSCH System : LU2 - Jetronic

Vehicle make : Opel

Basic microcard : KFZ-00..

SPECIAL FEATURES

This microcard contains the LU-Jetronic trouble-shooting instructions for the following Opel models valid at the time of writing:

Senator, Monza with 3.0 l/ 6 cyl. engine from 08.85.

* LU2-Jetronic with 25-pin control unit 0 280 001 312/313, triggered by term. 5 of the ignition control unit, 5-pin air-flow sensor and 7-pin control relay.
* Solenoid-operated fuel-injection valves with brass wire coil.
* Start control, i.e. additional injection quantity through all fuel-injection valves.
* Instead of auxiliary-air device: idle actuator and idle-speed controller (control-unit) of the low-idle-speed control.
* Double NTC for Jetronic and low-idle-speed control.
* Heated lambda sensor for lambda closed-loop control and three-way catalytic converter

Note:

The LU2-Jetronic in the Opel 3.0 1/6 cylinder engine essentially corresponds to that of the Opel 1.8 1/4 cylinder.

* Similar SIS repair instructions: SIS microcard OPE-512.

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER

* Universal test adapter 0 684 101 801 and
* Adapter cable 1 684 463 123 and 1 684 463 137

The following rapid diagnosis chart makes it possible for the experienced L-Jetronic specialist to rapidly test the electrical part of the system using the universal test adapter.

The rapid diagnosis chart contains the following information:

* Test-step sequence
* Position of the V- and Ω -program switch
* Remarks on the operation of the universal test adapter and other components
* Test specifications for motortester and multimeter

Rapid diagnosis chart for universal test adapter

Testing the LU2-Jetronic with adapter cable 1 684 463 123

Test step	Switch position V	Switch position Ω	Measurement	Control-unit plug between terminals	Remarks	Test specifications (reading)
1	5	–	t_D signal from ignition control unit term. 5	1 and 5	Disengage gear and start	Rectangular pulse on oscilloscope
2	6	–	Voltage from control relay term. 87	9 and 5	Disengage gear and start	8...15 V
3	7	–	Voltage from ignition and starting switch term. 50	4 and 5	Disengage gear and start	8...15 V
4	| V	11	Combined resistance in air-flow sensor term. 8	8 and 5	——	100...200 Ω
5	| V	12	Resistance of potentiometer in air-flow sensor term. 7	7 and 5	Deflect sensor flap all the way to stop	60...1000 Ω
6	| V	13	Resistance of double temperature sensor NTC II term. 10 (engine temperature)	10 and 5	—— +15°C...+30°C :	1,45...3,3 k Ω
					+80°C :	280...360 Ω
7	| V	14	Resistance of ground output stage term. 13	13 and 5	——	0...10 Ω
8	| V	15	Resistance of ground output stage term. 25	25 and 5	——	0...10 Ω

F03 —— ⟹

F04 —— ⟺

Rapid diagnosis chart for universal test adapter (continued)

Testing the LU2-Jetronic with adapter cable 1 684 463 123

Test step	Switch position V	Switch position Ω	Measurement	Control-unit plug between terminals	Remarks	Test specifications (reading)
9	|	16	Resistance of idle contact in throttle-valve switch term. 2	2 and 9	Pull plug connector from ignition control unit. Accelerator pedal at rest	0...10 Ω
					Slightly depress accelerator pedal	infinite Ω
10	|	17	Resistance of full-load contact in throttle-valve switch term. 3	3 and 9	Accelerator pedal at rest	infinite Ω
					Fully depress accelerator pedal (full-load position)	0...10 Ω
11	|	18	Resistance of 3 parallel-connected solenoid-operated fuel-injection valves term. 12 (group I)	12 and 9	Re-connect ignition control-unit plug connection + 20° C : + 80° C :	 8,2...10,9 Ω 8,7...11,7 Ω
12	|	19	Resistance of 3 parallel-connected solenoid-operated fuel-injection valves term. 24 (group II)	24 and 9	——— + 20° C : + 80° C :	8,2...10,9 Ω 8,7...11,7 Ω

Rapid diagnosis chart for universal test adapter

Testing low-idle-speed control with adapter cable 1 684 463 137

Test step	Switch position V	Switch position Ω	Measurement	Control-unit plug between terminals	Remarks	Test specifications (reading)
1	5	—	Voltage pulse from ignition coil term. 1	12 and 2	Idle-speed control (CU) not connected. Disengage gear and start.	Ignition pulse on oscilloscope
2	6	—	Voltage from control relay term.87b	1 and 2	Disengage gear and start.	8...15 V
3	7	—	Voltage through throttle-valve idle contact terms. 2 and 18	8 and 2	Idle-speed control (CU) connected. Disengage gear and start. Accelerator pedal at rest.	8...15 V
					Slightly depress accelerator pedal.	approx. 0 V
4	V	14	Resistance of double temperature sensor NTC II term. 67 (engine temperature)	9 and 2	+15°C...+30°C :	1,45...3,3 k Ω
					+80°C :	280...360 Ω
5	V	20	Resistance of idle actuator terms. 1 and 2	3 and 4	— +15°C...+30°C :	20...32 Ω
					+80°C :	24,5...37 Ω
6	V	21	Resistance of idle actuator terms. 3 and 2	5 and 4	— +15°C...+30°C :	18...29,5 Ω
					+80°C :	22...34 Ω
7	V	21	On-off ratio at idle speed Manual trans. : 770...830 min^{-1} Automatic : 30...34 min^{-1}	5 and 4	Connect dwell-angle tester to black test sockets 1 and 2 on universal test adapter. Engine at normal operating temperature :	670...730 %
					Accelerator pedal at rest :	27...31 %

TEST SPECIFICATIONS

Pressure regulator

* Fuel pressure:	2,8...3,2 bar

Electric fuel pump

* Delivery quantity in return line:	min. 850 cm ^{3} /30 s
* Connection voltage at load:	min. 12 V

Temp. sensor NTC II (engine)

Double NTC for LU2-Jetronic and low-idle-speed control

* Electrical internal resistance of each temperature sensor:	
At ambient temperature (+15°C...+30°C):	1,45...3,3 k Ω
With engine at operating temperature (approx. +80°C):	280...360 Ω

Lambda sensor heating

* Electrical internal resistance (PTC)	1,0...15 Ω

Air-flow sensor

* Resistance between:	
Terms.8 and 5:	340... 450 Ω
Terms.7 and 5: (fully deflect sensor flap)	60...1000 Ω
Terms.9 and 5:	500... 760 Ω
Terms.8 and 9:	160... 300 Ω

Start control with NTC II connection plug pulled

Connect ignition lead term.4 to ground via 5 k Ω sleeve-type suppressor and spark gap.

* Connection voltage at one solenoid-operated fuel injection valve: drops from initially more than 2,5 V within approx. 15 s starting time to approx. 0,3 V.

Test specifications (continued)

Solenoid-operated fuel-inj. valve

* Electrical internal resistance at + 20° C:	15,0...17,5 Ω

Idle actuator

* Electrical internal resistance of each winding	
Terms.3 to 4 +15°C...+30°C:	19,0...25,0 Ω
+80°C:	23,5...30,0 Ω
Terms.5 to 4 +15°C...+30°C:	17,0...22,5 Ω
+80°C:	21,0...27,0 Ω

Idle setting

Engine at normal operating temperature (approx. +80°C).

* Idle speed:	
Manual transmission:	770...830 min $^{-1}$
at on-off ratio:	30... 34 %
Automatic transmission:	670...730 min $^{-1}$
at on-off ratio:	27... 31 %
* CO setting via lambda closed-loop control Closed-loop control operation (sensor conn.), integrator voltage at test pin (term. 22)	Voltage reading oscillates between 2 values
Open-loop control (sensor lead separated):	Voltage reading must be identical with the oscillating mean value

Test specifications (continued)

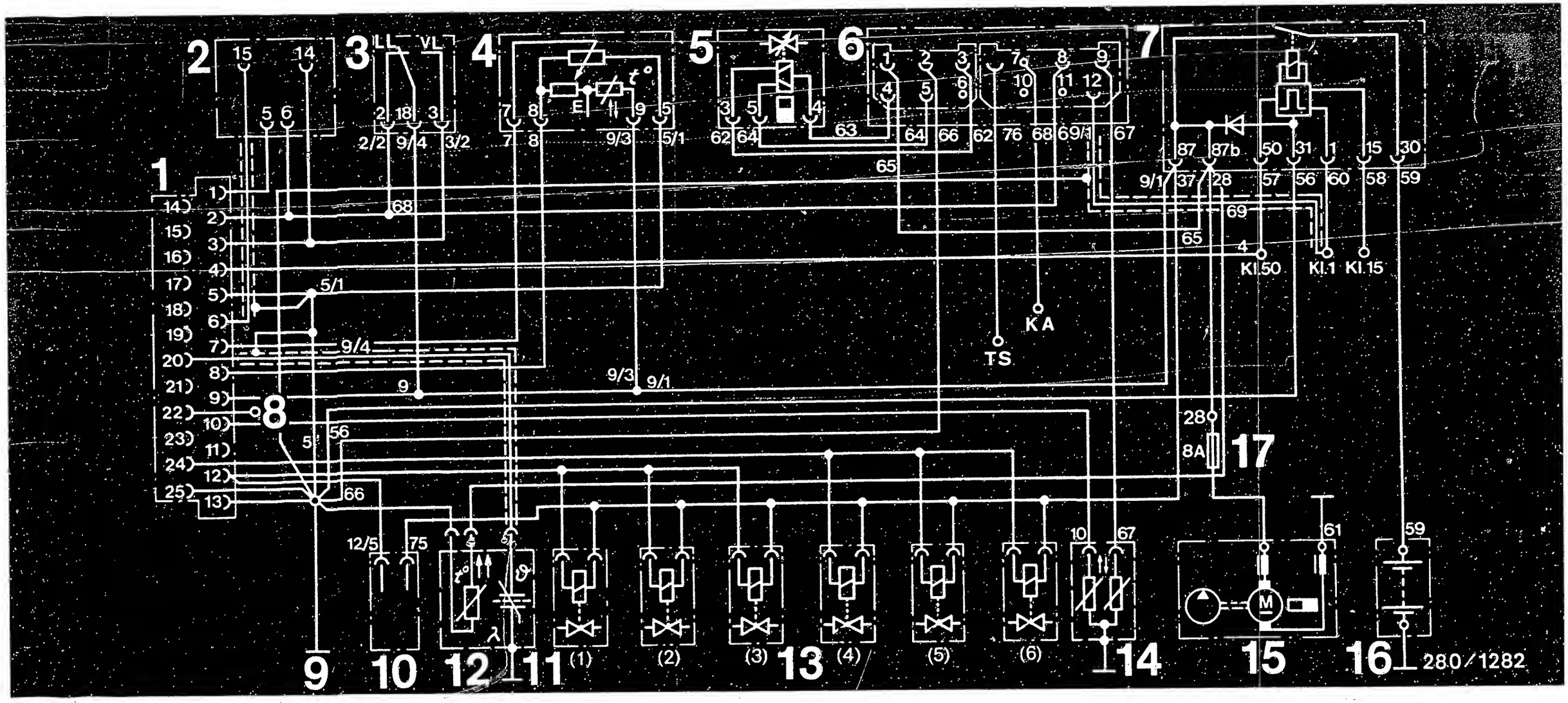
Lambda closed-loop control

* Rich value (disconnect sensor lead and connect to ground on control-unit side):	10...12 V
* Lean value (apply 2 V to the sensor lead on control-unit side):	approx. 0,5 V

Switch off the extractor unit while exhaust-gas measurement and adjustment are being carried out.

For adjusting values for ignition, valve clearance, and other engine technical data, see equipment and Autodata microcards.

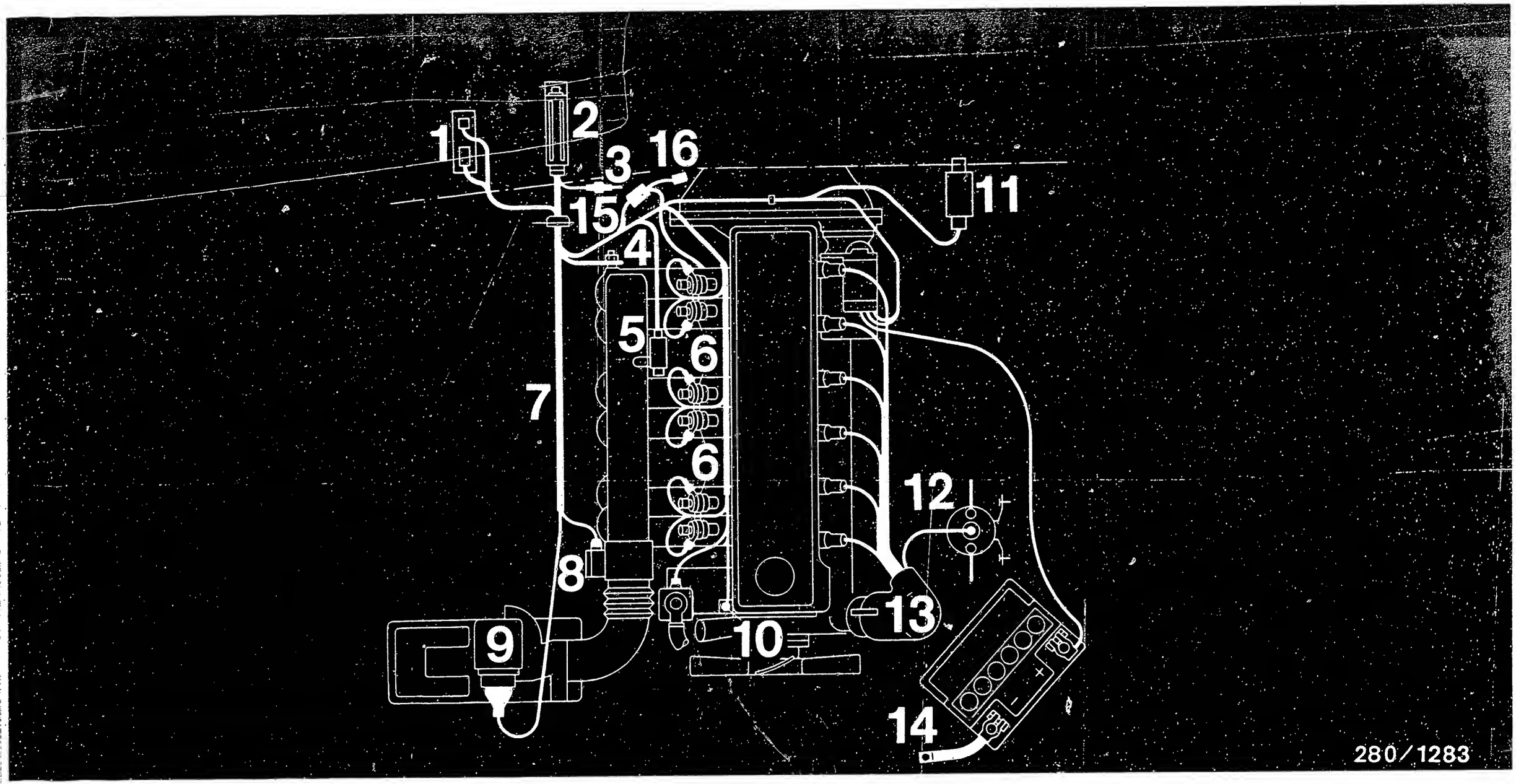
For production reasons:
continued on the following coordinate.



ELECTRICAL TERMINAL DIAGRAM

1 = Multiple-pin plug to control unit
2 = Ignition-control unit
3 = Throttle-valve switch
4 = Air-flow sensor
5 = Idle actuator
6 = Low-idle-speed control (control unit)
7 = Control relay
8 = Test pin (integrator voltage, lambda closed-loop control)
9 = Central ground, output stages and electronics
10 = On-board computer
11 = Heated lambda sensor
12 = 3-pin plug connection for heated lambda sensor
13 = Solenoid-operated fuel-injection valves
14 = Double temperature sensor (engine temperature NTC II)
15 = Electric fuel pump
16 = Battery
17 = Pump fuse

KA = Air conditioning
TS = Temperature switch

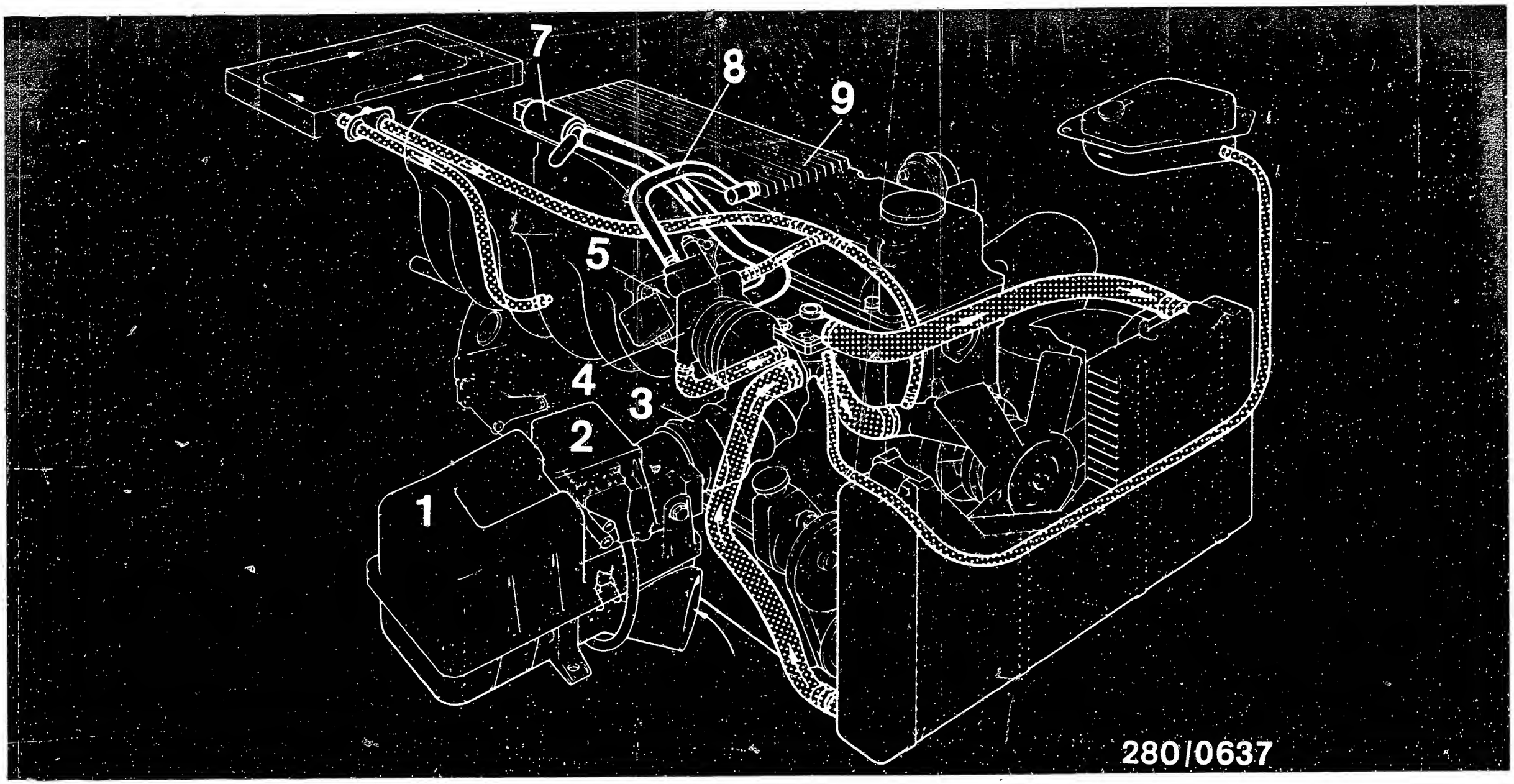


ELECTRICAL WIRING DIAGRAM AND ARRANGEMENT OF INDIVIDUAL COMPONENTS

1 = Low-idle-speed control
2 = Control unit
3 = Plug connection term. 1
4 = Central ground
5 = Idle actuator
6 = Solenoid-operated fuel-injection valves
7 = Jetronic wiring harness
8 = Throttle-valve switch
9 = Air-flow sensor
10 = Double temperature sensor (engine temperature NTC II)
11 = Control relay
12 = Ignition coil
13 = Ignition distributor
14 = Battery
15 = 3-pin plug connection for heated lambda sensor
16 = Test pin (integrator voltage)

F15 —⟹

F16 —⟸

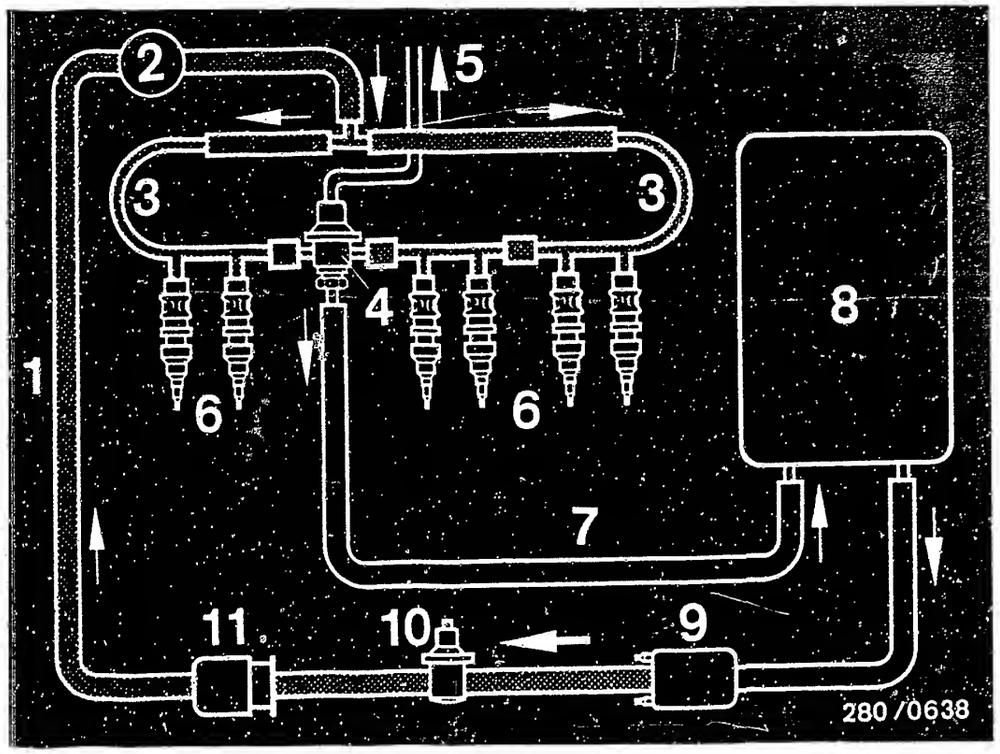


AIR-LINE DIAGRAM

———— = Air hose lines

- - - - - - - - - - - = Water hose lines

1 = Air filter
2 = Air-flow sensor
3 = Air guide hose
4 = Intake-manifold heating
5 = Throttle-valve assembly
6 = Intake manifold
7 = Idle actuator
8 = Crankcase ventilation
9 = Valve cover



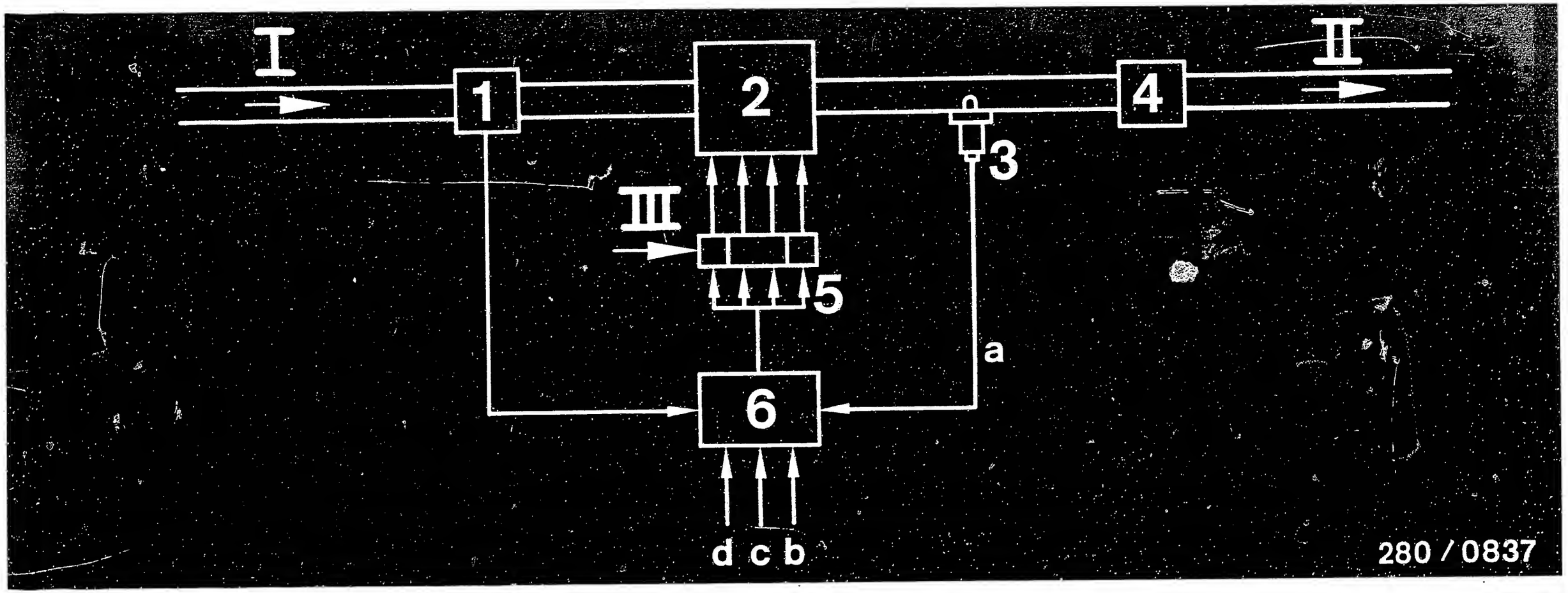
FUEL-LINE DIAGRAM

For production reasons:
continued on the following coordinate.

——————— = Pressureless

!!!!!!!!!!!!!!!! = Fuel pressure

1 = Fuel-injection tubing
2 = Damper unit
3 = Ring fuel main
4 = Pressure regulator
5 = Intake-manifold pressure connection
6 = Solenoid-operated fuel-injection valves
7 = Return line
8 = Fuel tank
9 = Electric fuel pump
10 = Pressure damper
11 = Fuel filter



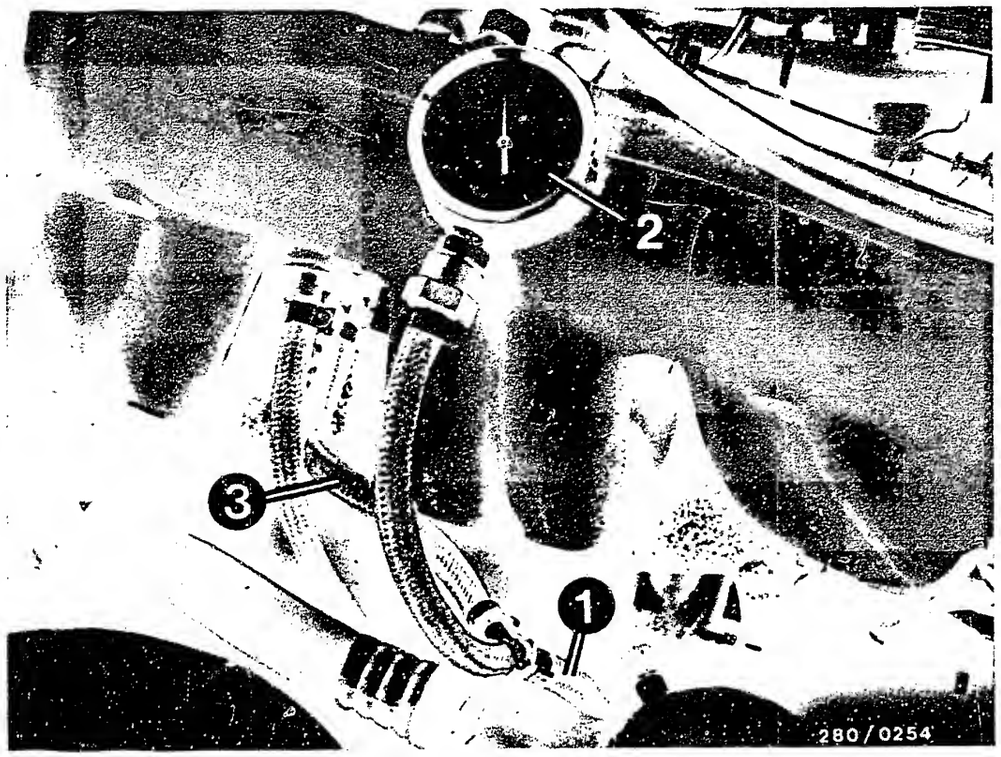
1 = Air-flow sensor
2 = Engine
3 = Lambda sensor
4 = 3-way catalytic converter
5 = Solenoid-operated fuel-injection valves
6 = LU control unit with lambda closed-loop control

a = Sensor voltage
b = Supply voltage
c = Engine speed
d = Engine temperature

I = Air
II = Exhaust
III = Fuel

OPERATION OF LAMBDA CLOSED-LOOP CONTROL

The control loop, closed with the help of a special sensor - the lambda sensor - allows deviations from a certain air-fuel ratio to be recognized and corrected. The closed-loop control principle is based on continuous monitoring of the residual oxygen content of the exhaust by the lambda sensor. This provides a measurement for the composition of the air-fuel mixture provided to the engine. The lambda sensor in the exhaust pipe supplies information on whether the mixture is richer or leaner than lambda = 1. This deviation is supplied to the control unit and the lambda control (in the control unit) influences the injection duration or quantity pre-calculated by the fuel-injection control. This regulation to lambda = 1 is the essential prerequisite for a high rate of effectiveness of pollutant combustion in the 3-way catalytic converter.



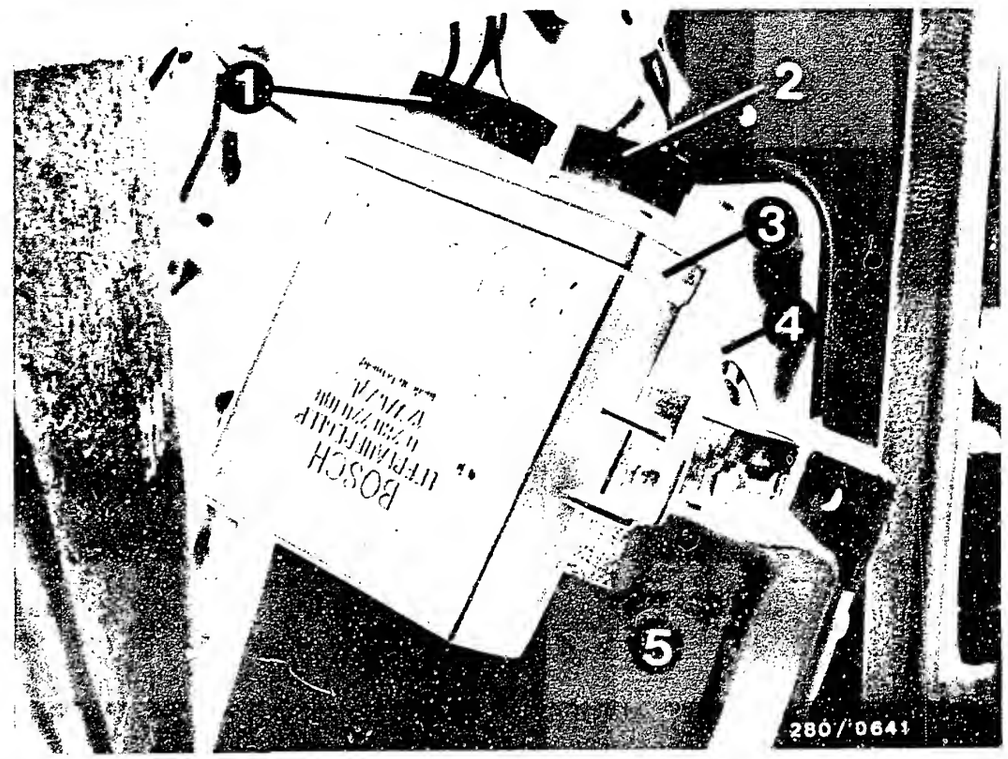
1 = To connection port (pressure side)
2 = Pressure gauge
3 = Fuel delivery line

FUEL-PRESSURE TEST

Use the pressure gauge and hose line of pressure-testing device KDJE-P 100 or 1 687 231 154 for pressure testing.

Connect 3-way line KDJE-P 100/13 between the fuel-distribution pipe and the fuel-injection tubing.

Important:
Make sure that no fuel gets on hot engine parts.

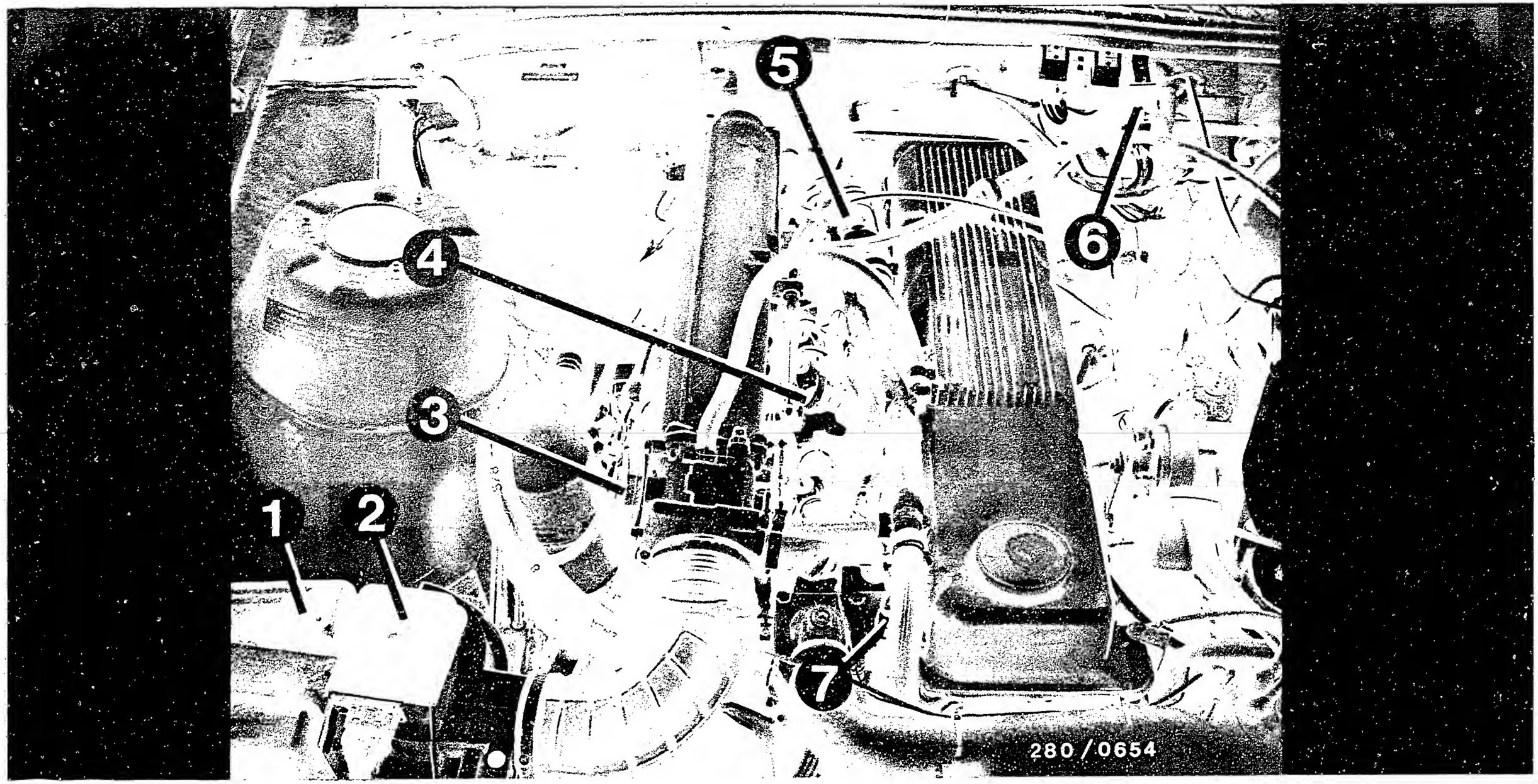


LU2 Jetronic low-idle-speed control
1 = 8-pin plug
2 = 6-pin plug
3 = Low-idle-speed control (control unit)
4 = 25-pin control-unit plug
5 = Control unit

INSTALLATION POSITION OF COMPONENTS

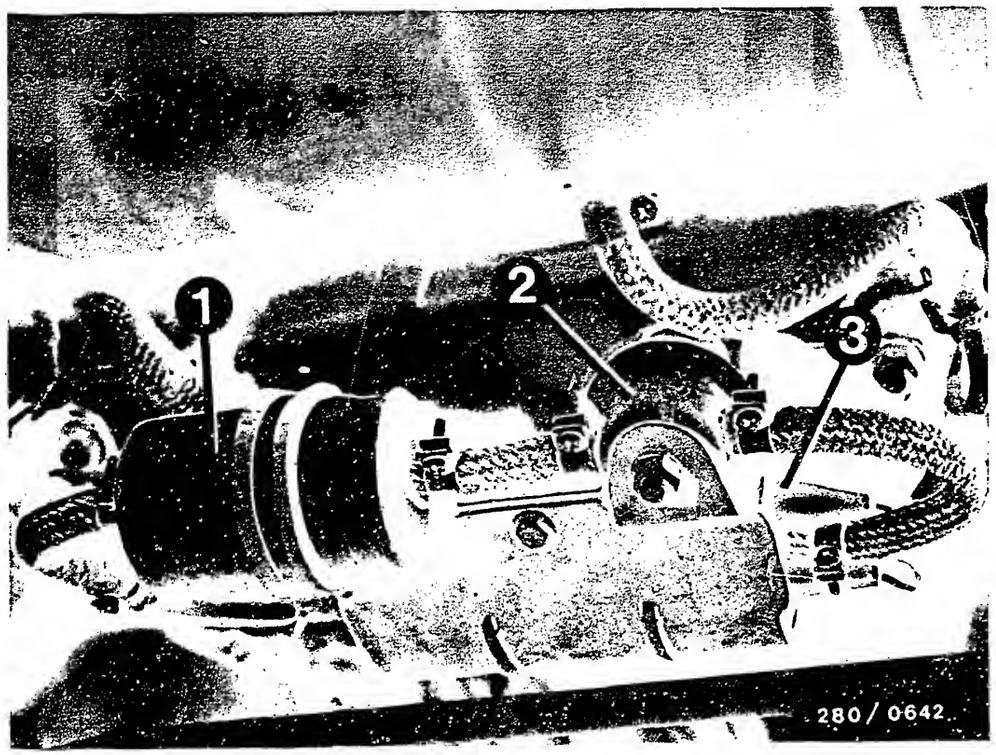
* Control units in passenger compartment. All position information is with reference to the direction of travel.

Both control units are located one above the other in the footwell on the passenger's side on the lower right:
LU2-Jetronic - Connect the universal test adapter to the control-unit plug using the 25-pin adapter cable.
Low-idle-speed control - plug in the universal test adapter with the 6/8-pin adapter cable between the two plugs and low-idle-speed control (control unit).



* Arrangement of components on engine

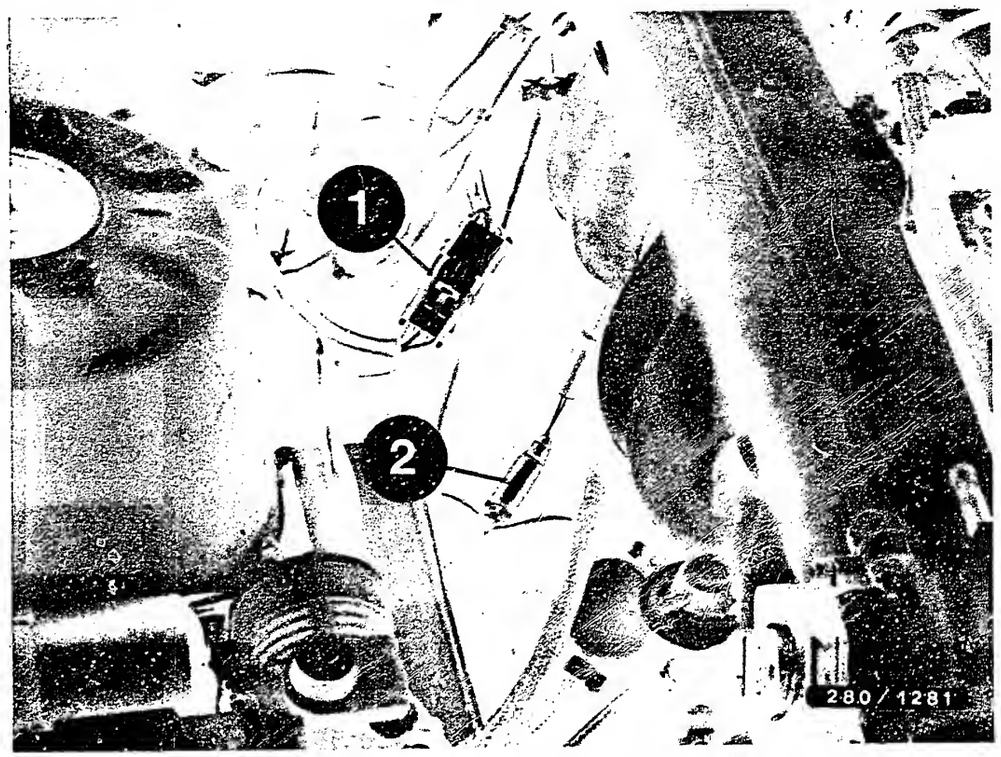
1 = Air filter
2 = Air-flow sensor
3 = Throttle-valve switch
4 = Fuel-injection valves
5 = Idle actuator
6 = Control relay
7 = Double temperature sensor (engine temperature NTC II)



1 = Fuel filter
2 = Pressure damper
3 = Electric fuel pump; protected from contamination by mounting plate (partly covered in illustration)

* Fuel-supply system components

All three components are located on the bottom of the vehicle to the right of the fuel tank.



1 = 3-pin plug connection for heated lambda sensor
2 = Lambda sensor

The test pin (term. 22) for measuring integrator voltage is located in the engine compartment (firewall).

* Central ground

The electronics and output-stage ground are combined on the intake tube of cylinder 6.

* Pressure regulator

On the ring fuel main between the intake tubes of cylinders 2 and 5.

Trouble-shooting instructions	:	CIT-5001
BOSCH system	:	TZ-I
Make of vehicle	:	CITROEN
Basic microcard	:	KFZ-00..

TABLE OF CONTENTS

SPECIAL FEATURES

These trouble-shooting instructions, valid at the time of application, apply to the following Citroen models:

AX, AX 11 and AX 14 with engine type TU (33, 37. 40 and 44 kW)

* Ignition distributor with built-on trigger box (TI-I).
* Trigger box 0 227 100 140 for all vehicle models.
* Ignition coil 0 221 502 393 or competitor's product
* The set values given in these brief instructions apply to Bosch products and cannot be used for competitor's products or can at the most be used as a reference value.

USAGE, STRUCTURE

These brief instructions encompass essentially vehicle-specific special features and test specifications (set values).

In accordance with the customer complaint, the trouble-shooting chart leads to various causes/ component faults.

Detailed instructions for trouble-shooting must be taken from the basic instructions via the trouble-shooting chart.

ATTENTION: Even if reference is made to basic instructions, the set values, terminal assignments and special features of t h e s e vehicle-related brief instructions are a l w a y s binding.

SAFETY AND PRECAUTIONARY MEASURES

Keep persons out of danger.
Prevent damage to the engine, trigger box or ignition system.

* C A U T I O N !
  High-performance ignition system.
  Dangerous primary and secondary voltages.

  Touching voltage-carrying components or terminals may prove fatal (both on the primary and secondary sides).

* When testing the compression, disconnect the trigger-box plug or connect ignition coil term. 4 f i r m l y to ground using auxiliary cable.

N O T E :
Auxiliary cable must be interference-suppressed with at least 2 k Ω .

See basic instructions for further precautionary measures.

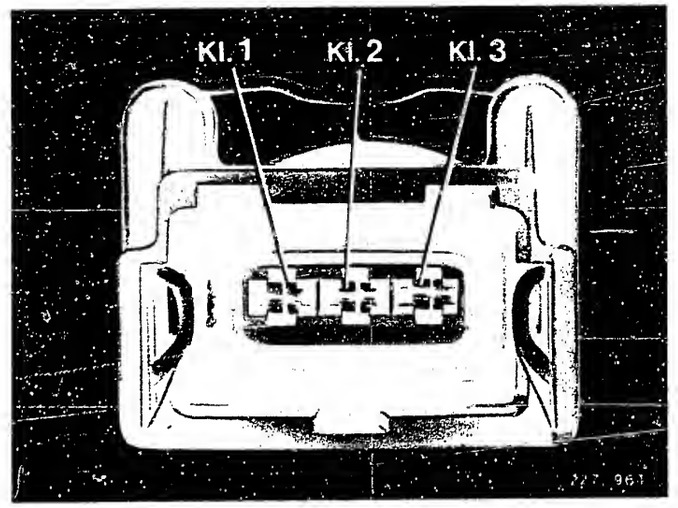
TROUBLE-SHOOTING CHART

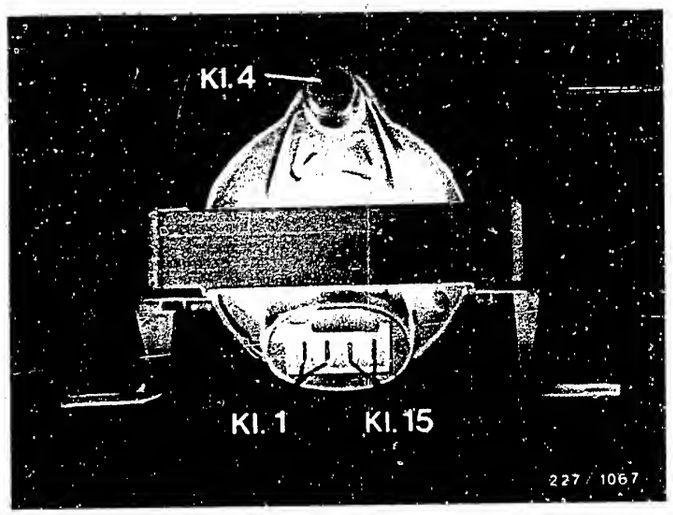
Customer complaint (symptoms of trouble)

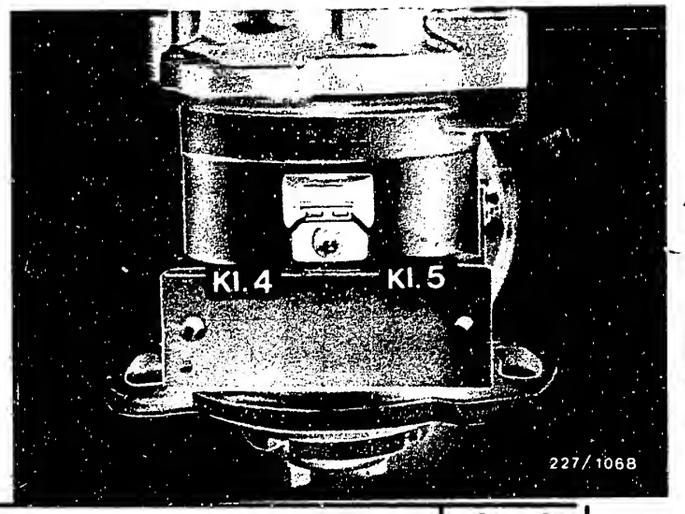
1. Starting motor operates, but engine fails to start or starts only with difficulty.	2. Engine starts but then dies.	3. Rough idling (engine speed, exhaust gas).	4. Poor throttle response, flat spot during acceleration.	5. Engine misfiring (ignition, fuel induction).	6. Maximum engine power/top speed not reached.	7. Fuel consumption too high.	8. Engine running on (dieseling).	9. Engine pinging/knocking.	10. Engine overheating.	11. Fault lamp.	Cause (component fault)
*		*	*	*	*	*					High-voltage side
*		*	*	*	*						Ignition coil
*		*									Firing order
*											Voltage, trigger box
*											Voltage, primary circuit
*			*	*							Magnetic pulse generator
*											Contact resistances
		*	*	*	*	*		*	*		Ignition point
				*							Voltage, trigger box
				*							Voltage, ignition coil
*											Output stage
				*							Primary voltage
			*	*		*	*		*	*	Centrifugal advance
			*	*			*		*	*	Vacuum advance

RAPID DIAGNOSIS CHART

Test step	Testing of components/function Test instructions/conditions	Terms.	Set values
1	HIGH-VOLTAGE END, visual examination (distributor cap, ignition harness etc.) Ignition oscillogram	———	———————
2	IGNITION COIL, visual examination, plugs present, sealing compound escaped? Resistance, primary Resistance, secondary	 1 15 1 4	 0,5...0,9 Ω 6,6...12,1 k Ω
3	VOLTAGE SUPPLY, TRIGGER BOX Ignition ON. Voltage, trigger box plug	3 2 + –	approx. U_B
4	PRIMARY CIRCUIT Ignition ON. Voltage, trigger box plug	1 2 + –	approx. U_B
5	MAGNETIC PULSE GENERATOR The ignition distributor must be dismantled from the engine and the trigger box removed for the following tests. 1. Visual examination (mechanical damage), timer core must not brush against generator teeth. 2. Winding resistance, ignition-distributor plug connection. 3. Insulation resistance, ignition-distributor plug connection.	 4 5 4 31 5 31	 265...465 Ω infinite Ω



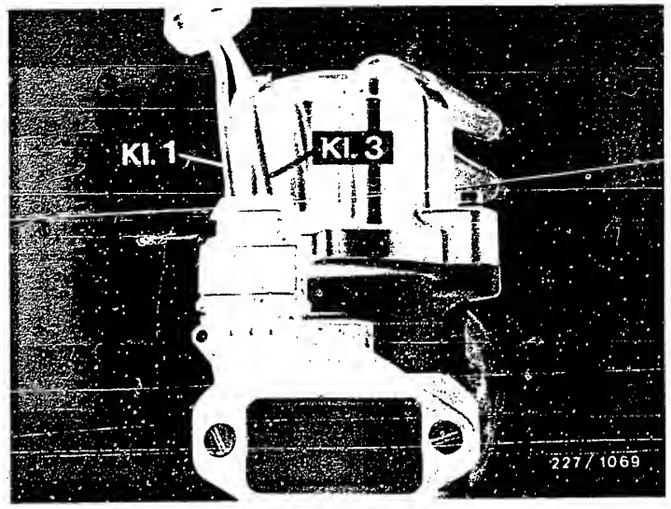


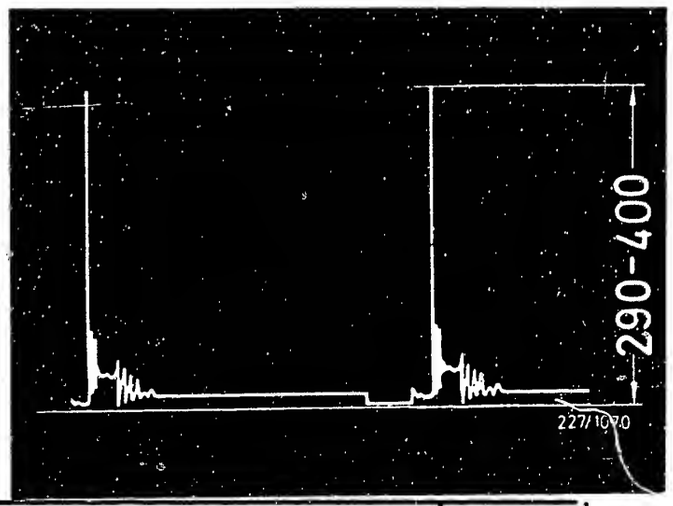


RAPID DIAGNOSIS CHART (CONTINUED)

Test step	Testing of component/function Test instructions/conditions	Terminals	Set values
6*	CONTACT RESISTANCES Check voltage-supply leads of trigger box and primary circuit for contact resistance.	——	Max. 0.3 Ω
7	Adjust IGNITION POINT.	——	Autodata test specifications
8	VOLTAGE SUPPLY, TRIGGER BOX Engine at idle. Voltage, trigger-box plug	3 2 + −	12...14 V, max. 1 V below batt. +ve
9	VOLTAGE SUPPLY, IGNITION COIL Engine at idle. Voltage, ignition coil and vehicle ground (use adapter for ignition coil)	15 31 + −	Min. 10 V
10	OUTPUT STAGE Ignition ON. Voltage, ignition coil	15 1 + −	0 V
11	PRIMARY VOLTAGE Voltage, ignition coil with engine at idle	15 1 + −	290...400 V

* = Conduct test only when engine is not running.

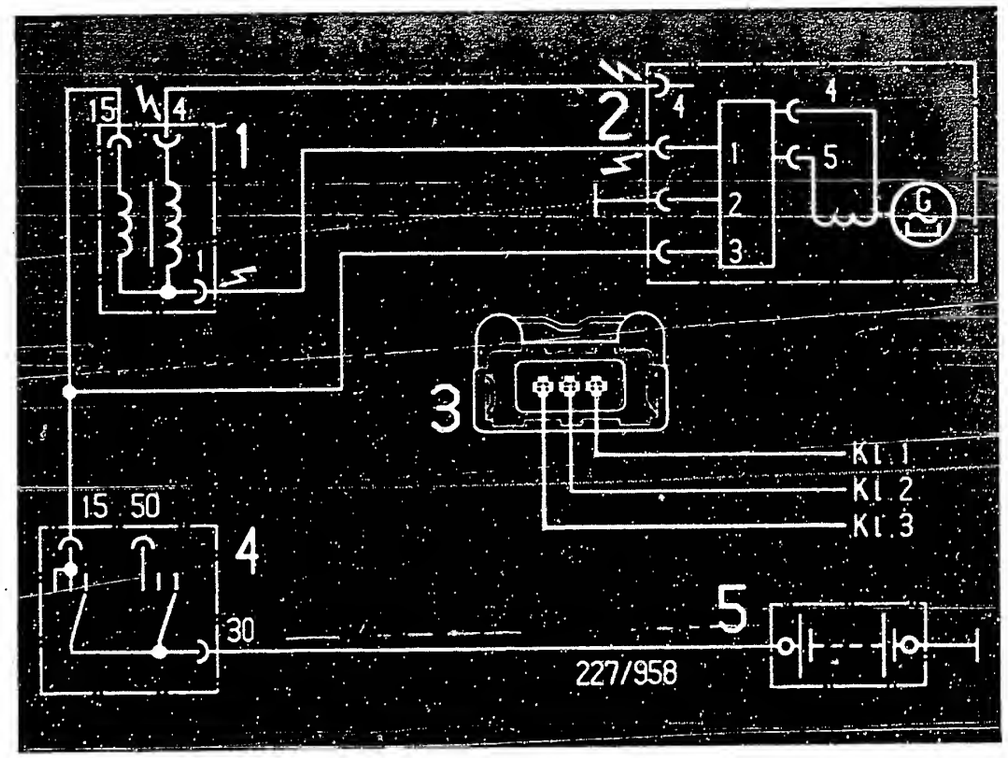




TEST SPECIFICATIONS

Ignition coil, primary	0,5...0,9 Ω
Ignition coil, secondary	6,6...12,1 k Ω
Voltage supply trigger box at engine idle	12...14 V
Voltage supply ignition coil at engine idle	min. 10 V
Primary voltage at engine idle	290...400 V
Magnetic pulse generator	
Insulation	infinite Ω
Internal resistance	265...465 Ω

See Autodata test specifications for settings for ignition, idle speed, CO concentration etc.



High-voltage symbols = Dangerous voltages (400 V...25 kV)

1 = Ignition coil

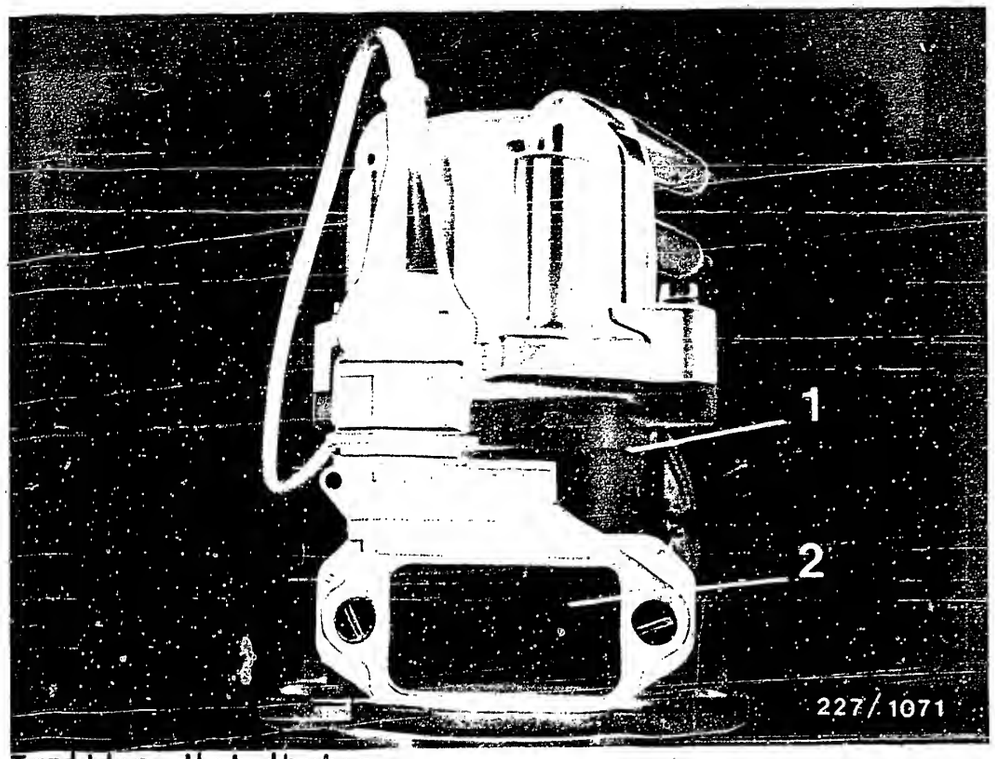
2 = Ignition distributor with trigger box

3 = Trigger-box plug

4 = Ignition and starting switch

5 = Battery

ELECTRICAL TERMINAL DIAGRAM



1 = Ignition distributor

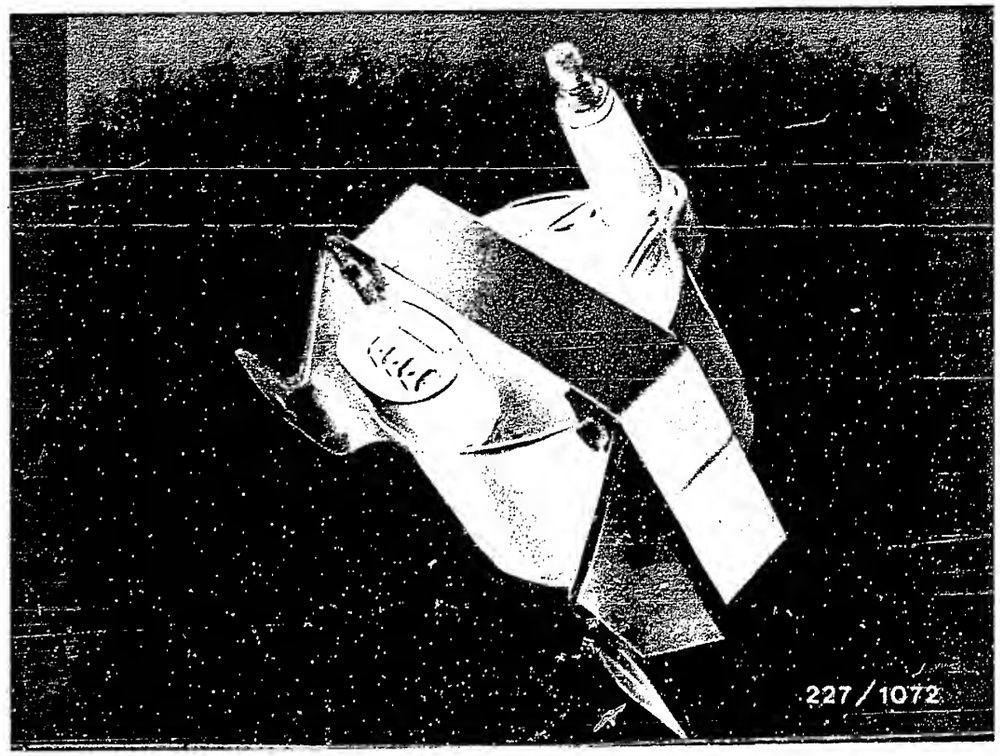
2 = TI-I trigger box

Installation position of components

The TI-I trigger box is bolted on to the ignition distributor.

Note on removal:
Loosen ignition-distributor mounting.
Loosen two screws and remove trigger box.

After installing the trigger box, set the ignition point; see Autodata test specifications.



INSTALLATION POSITION OF COMPONENTS (Continued)

The ignition coil is bolted on to the cylinder head.

Trouble-shooting instructions : ALF-5011

BOSCH system : L3.2-Jetronic

Make of vehicle : ALFA ROMEO

Basic microcard : KFZ-00..

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SPECIAL FEATURES

These brief instructions, valid at the time of publication, apply to the following vehicle model:

ALFA ROMEO 33 1.7 i.e. 10.87->
with 1.712 l / 4-cyl. engine

* L3.2-Jetronic with 15-pole control unit: 0 280 000 602
* Engine-speed triggering from term.1 of ignition coil.
* Control unit attached directly to air-flow sensor.
* Air-flow sensor is connected to the control unit via an internal 4-pole plug connection.
* CO adjusting screw at control unit.
* Actuation of electric fuel pump by control unit via pump relay.
* Supply voltage for control unit via main relay.
* Lambda closed-loop control
* Start control, i.e. additional quantity of fuel injected via all injection valves.
* Tank ventilation system with active-carbon container and vacuum-controlled tank ventilation valve.
* Use pressure gauge and hoses of pressure measuring device KDJE-P 100 for testing fuel pressure.
* Connect connecting piece KDJE-P 100/16 between fuel inlet line and pressure regulator.

STRUCTURE, USAGE

These brief instructions essentially comprise vehicle-specific special features and test specifications (set values).

In line with the customer complaint, the trouble-shooting chart pinpoints various causes/ component faults.
Detailed trouble-shooting information is given in the trouble-shooting chart in the basic instructions.

NOTE: Even if reference is made to basic instructions, the set values, terminal assignments and special features given in these vehicle-specific brief instructions are always binding.

Uniform test-step numbering facilitates location of individual test steps in the brief and basic instructions.

SAFETY AND PRECAUTIONARY MEASURES

Pay attention to the information given in the basic instructions, so as to avoid personal injury and so as to prevent engine, trigger-box, control-unit or ignition system damage.

C A U T I O N !
High-powered ignition system with hazardous high and low voltages!

Coming into contact with parts or terminals which carry voltage can be fatal (on both primary and secondary sides).

Avoid injection when testing compression.
The pump relay should therefore be detached.

Refer to basic instructions for other precautionary measures.

TROUBLE-SHOOTING CHART

Customer complaint (fault symptoms)

1. Starting motor operates, engine fails to start or starts only with difficulty.	2. Engine starts but then dies.	3. Idle problems (engine speed, exhaust gas).	4. Poor throttle take-up, flat spot during acceleration.	5. Engine missing (ignition, injection).	6. Maximum engine power/top speed not reached.	7. Fuel consumption too high.	8. Engine running on (dieseling).	9. Engine pinging/knocking.	10. Engine overheating.	11. Fault lamp.	Cause (component fault)
*	*	*	*	*	*	*			*		Universal test adapter
*	*	*	*		*						Air-intake system
*	*	*	*								Auxiliary-air device
*		*	*	*	*	*					Air-flow sensor
				*	*						Fuel delivery
*	*	*	*		*	*	*				Fuel pressure, leaks
		*									Pump noise
		*		*	*	*	*				Solenoid-operated injection valves
				*							Alternator, interference suppression
*	*	*				*					Start control
				*		*					Overrun cutoff
		*	*	*		*					Engine-speed, CO adjustment
		*	*	*	*						Lambda closed-loop control
						*					Catalytic converter

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01
Adapter lead: 1 684 463 168

Test step	Switch V	Switch Ω	Terminals	Testing of component/function	Test instructions/ test conditions	Set values
1	| V	5	8 – 5	Resistance of temperature sensor (engine)	Only connect control-unit plug Engine temperature +15...+30 °C : approx. +80 °C :	 1.45...3.3 k Ω 280...360 Ω
2	| V	6	4 – 5	Ground connection of output stage		0...10 Ω
3	| V	7	6 – 5	t v coding	Connect end of lead from term.6 to ground	0...10 Ω
4	| V	9	15 – 5	Throttle-valve switch/ resistance of idle contact	Detach plug from ignition control unit. Throttle valve closed : Throttle valve open :	 0...10 Ω infinity Ω
5	| V	10	14 – 5	Throttle-valve switch/ resistance of full-load contact	Plug remains detached. Throttle valve closed : Throttle valve fully open :	 infinity Ω 0...10 Ω
6	5	10	1 – 5 (+) (–)	Term.1 signal from ignition coil term.1	Attach plug of ignition control unit. Transmission in neutral, start engine	Ignition pulses on oscilloscope
7	6	10	2 – 5 (+) (–)	Voltage supply of control unit	Switch on ignition	8...15 V
8	7	10	12 – 5 (+) (–)	Winding of pump relay	Switch on ignition	8...15 V

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01 (CONTINUED)
Adapter lead: 1 684 463 168

Test step	Switch V	Switch Ω	Terminals	Testing of component/function	Test instructions/ test conditions	Set values
9	7	10	12 – 5	Simulation of electric-fuel-pump actuation	Detach connector from auxiliary-air device Switch on ignition Press test button 3	Electric fuel pump should be heard to run
9.1	7	10	12 – 5	Simulation of auxiliary-air-device actuation	Attach connector to auxiliary-air device Switch on ignition Press test button 3	Perform visual inspection to see whether air cross-section is closed off
10	7	10	12 – 5 (+) (–)	Ground actuation of pump relay term.85 by control unit	Connect up control unit Transmission in neutral, start engine Allow engine to idle	0...5 V
11	8	10	11 – 5 (+) (–)	Air-flow signal U_p output term. 11	Run engine	0...5 V load-dependent
12	9	10	7 – 5 (+) (–)	Jumper from term.7 to term.2	Run engine	8...15 V
13	10	10	3 – 5 (+) (–)	Injection pulses from control unit	Run engine	Injection pulses on oscilloscope
14	11	10	10 – 5 (+) (–)	Sensor monitoring	Run engine	0...1.0 V
15	12	10	9 – 5 (+) (–)	Reference voltage U_V output term. 9	Run engine	3.5...4.5 V

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01 (CONTINUED)
Adapter lead :1 684 463 168

Test step	Switch V	Switch Ω	Terminals	Testing of component/function	Test instructions/ test conditions	Set values
16	10	10	3 – 5 (+) (–)	Simulation of cold engine	Run engine, press test button 1	Injection pulse wider or engine speed lower
17	10	10	3 – 5 (+) (–)	Simulation of warm engine	Run engine, press test button 2	Injection pulse must not become wider
18	10	10	3 – 5 (+) (–)	Overrun-cutoff simulation	Run engine, engine speed in excess of 2000 min^{-1} Press test button 5	No injection pulses, engine hunts
19	10	10	3 – 5 (+) (–)	Simulation of full-load correction	Run engine, engine speed approx. 2400 min^{-1} Press test button 6	Slight change in injection pulse/ engine speed
20	11	10	10 – 5 (+) (–)	Measurement output – lambda closed-loop control (mixture adjustment)	Run engine Press test button 4 Turn CO adjusting screw until voltage reading fluctuates uniformly between 0...13 V.	0...13 V fluctuating

TEST SPECIFICATIONS

Components/operation	Set values
Electric fuel pump	
* Fuel delivery at return:	at least 600 cm ^{3} /30 s
* Supply voltage under load:	at least 12V
Pressure regulator	
* Fuel pressure	
with engine not running:	2,8...3,2 bar
at idle speed:	approx. 0.5 bar lower
Fuel system, leakage	
* Fuel pressure 20 min. after engine switched off:	at least 1.0 bar
Auxiliary-air device	
* Internal elec. resistance:	35...70 Ω
Air-flow sensor, only measurable if control unit is removed.	
* Resistance value between	
term.3- and term.4- :	500...1000 Ω
term.3- and term.2- :	
Air-flow sensor flap in rest position	10...200 Ω
When air-flow sensor flap is deflected, indication must change:	
Temperature sensor (intake air), only measurable if control unit is removed.	
* Internal electrical resistance, between term.3- and term.1-, at ambient temperature +15...+30 °C:	1.45...3.3 k Ω

TEST SPECIFICATIONS (CONTINUED)

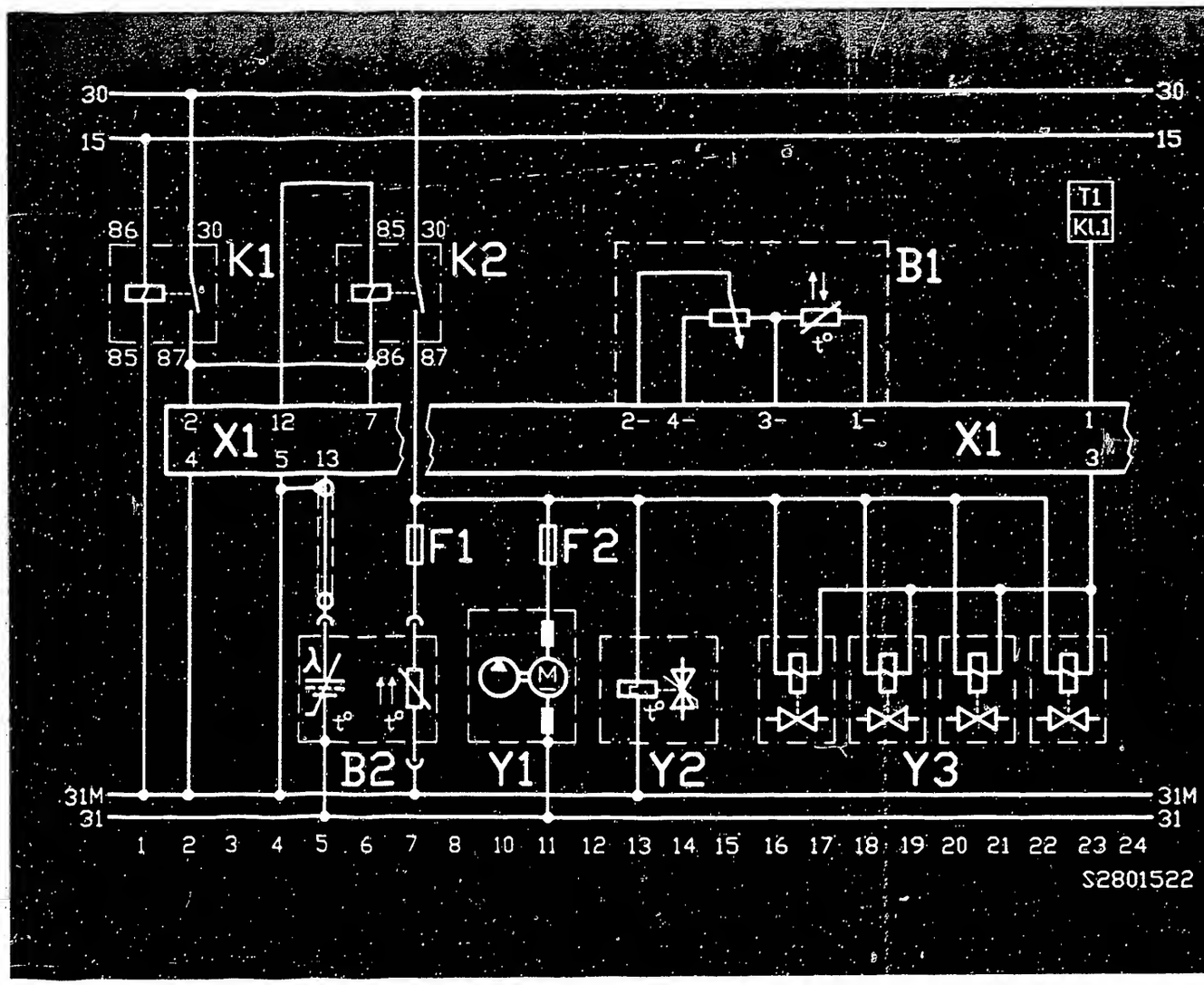
Component/function	Set values
Temperature sensor (engine)	
* Internal resistance at ambient temperature +15...+30 °C :	1.45...3.3 k Ω
with engine at operating temperature approx. +80 °C :	280...360 Ω
Solenoid-operated injection valve	
* Internal resistance at ambient temperature +15...+30 °C :	14,5...17,5 Ω
* Leakage after 60 s:	no droplet may drip off
Start control	
*Voltage at injection valve	
Start initiation :	approx. 1.5 V
after approx. 15s:	approx. 0.5 V
Idle-speed adjustment	
Engine at operating temperature, approx. +80°C	
* Idle speed:	900...1050 min $^{-1}$

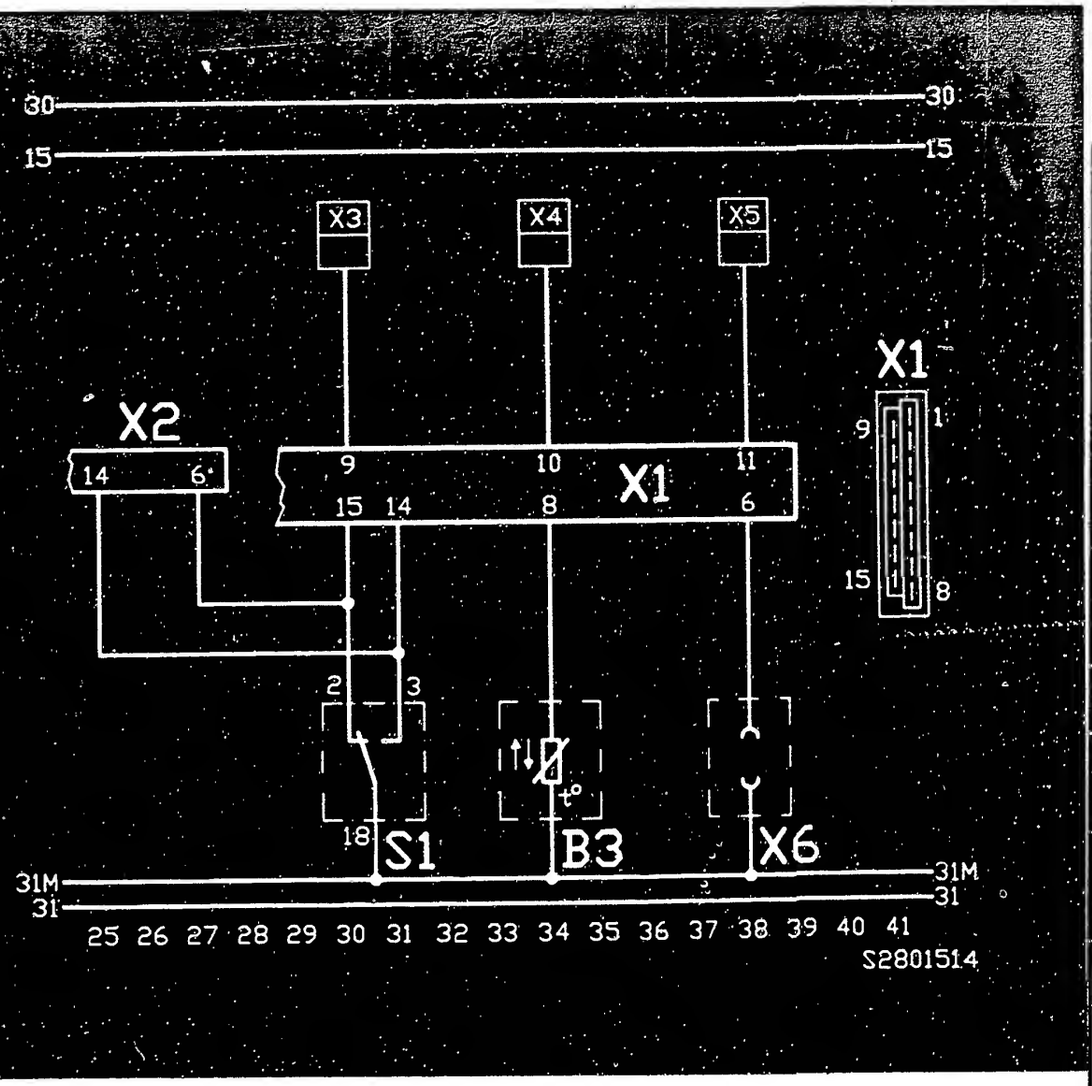
TEST SPECIFICATIONS (CONTINUED)

Component/function	Set values
CO adjustment Engine at operating temperature, approx. +80°C Short-circuit idle and full-load switch to vehicle ground.	
Integrator voltage (Test pin term.10)	
* Open-loop control (disconnect plug connection of sensor lead):	Fixed voltage value between 10...13 V
* Closed-loop control (connect plug connection):	Reading fluctuates between 0...13 V
* Setting:	Reading fluctuating uniformly betw. 0...13V
* Rich value (disconnect plug connection and connect control-unit lead to ground):	10...13 V
* Lean value (apply 2V to control-unit lead):	less than approx. 1.0 V

Refer to equipment and Autodata microcard for settings as regards ignition and valve clearance as well as for other engine-related data.

For production reasons:
continued on the following coordinate.

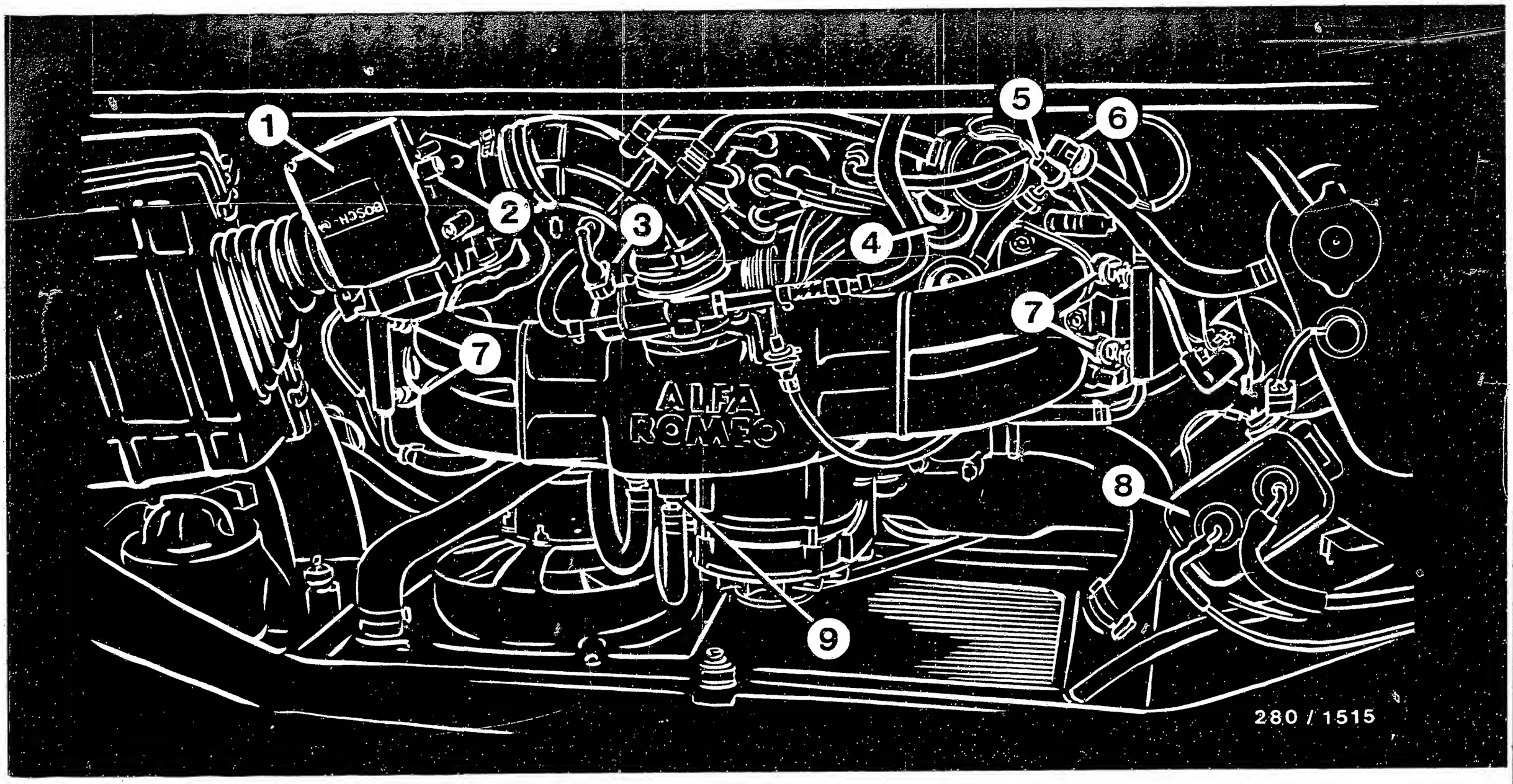




B1 = Air-flow sensor with temperature sensor (intake air)
B2 = Heated lambda sensor
B3 = Temperature sensor (engine)
F1 = Fuse for sensor heater
F2 = Pump fuse
K1 = Main relay
K2 = Pump relay
S1 = Throttle-valve switch
X1 = Jetronic control-unit plug
X2 = Control-unit plug (ignition)
X3 = U y output, reference voltage
X4 = Test output for lambda closed-loop control and diagnosis output
X5 = U p output, air-flow signal
X6 = t y coding or diagnosis stimulation
Y1 = Electric fuel pump
Y2 = Auxiliary-air device
Y3 = Solenoid-operated injection valves

ELECTRICAL TERMINAL DIAGRAM

H15 —⟹
H16 ⟸—



1 = Measuring and control unit consisting of air-flow meter and control unit
2 = CO adjustment potentiometer (lambda closed-loop control)
3 = Throttle-valve switch
4 = Pressure regulator
5 = Plug, lambda sensor
6 = Plug, sensor heater
7 = Solenoid-operated injection valves
8 = Activated carbon canister
9 = Idle-speed adjusting screw

INSTALLATION POSITION OF COMPONENTS

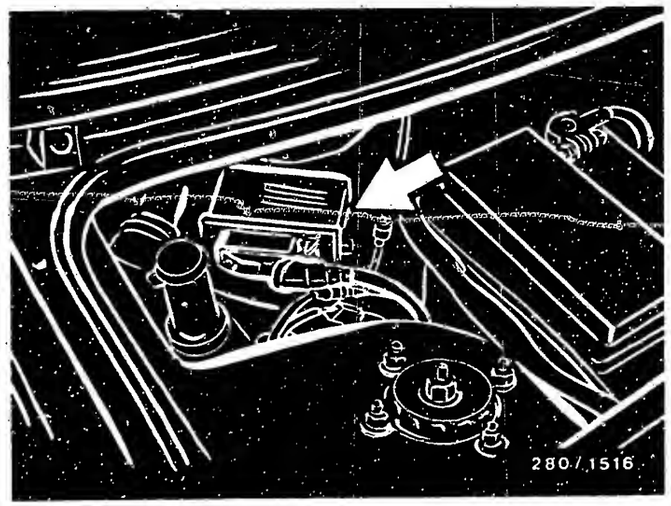
INSTALLATION POSITION OF COMPONENTS (CONTINUED)

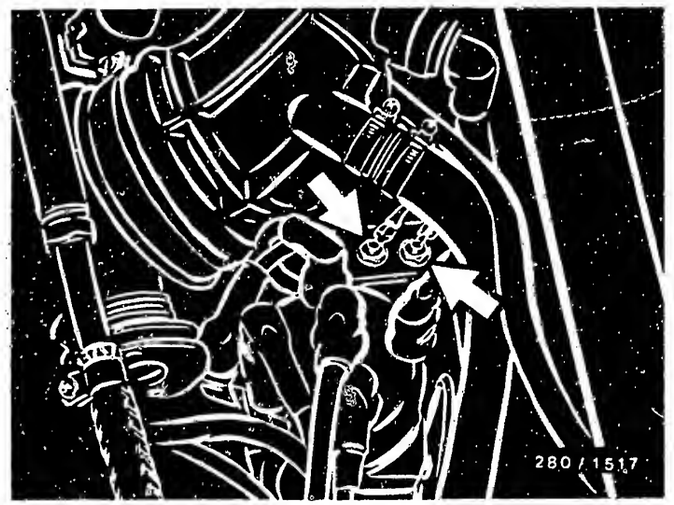
The directions "left" and "right" are always with reference to the forward direction of travel.

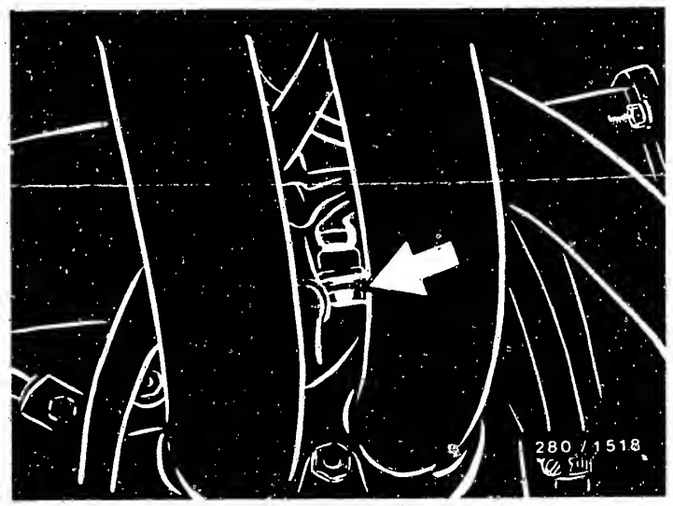
* Upper illustration
  Arrow = Ignition control unit

* Center illustration
  Arrow = Central ground

* Lower illustration
  Arrow = Temperature sensor (engine)
  On the right-hand side between the intake-manifold passages.







INSTALLATION POSITION OF COMPONENTS (CONTINUED)

* Upper illustration
  Arrow = Electric fuel pump
  At the vehicle floor behind the left-hand McPherson strut.

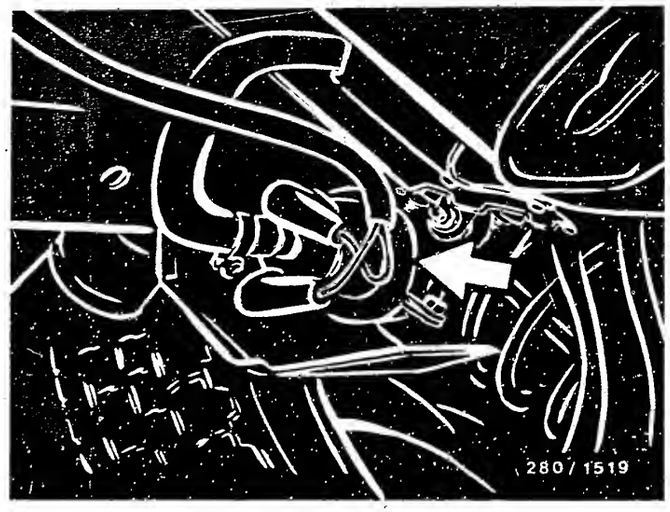
* Center illustration
  Arrow = Fuel filter

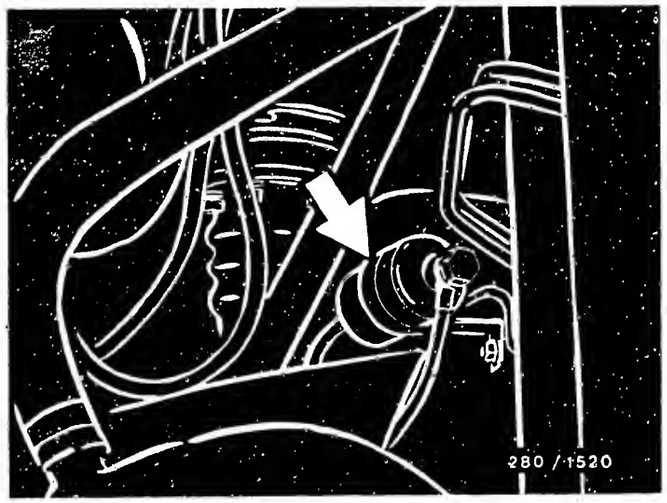
* Lower illustration
  1 = Main relay
  2 = Pump relay
  Both relays are located beneath a protective cover.

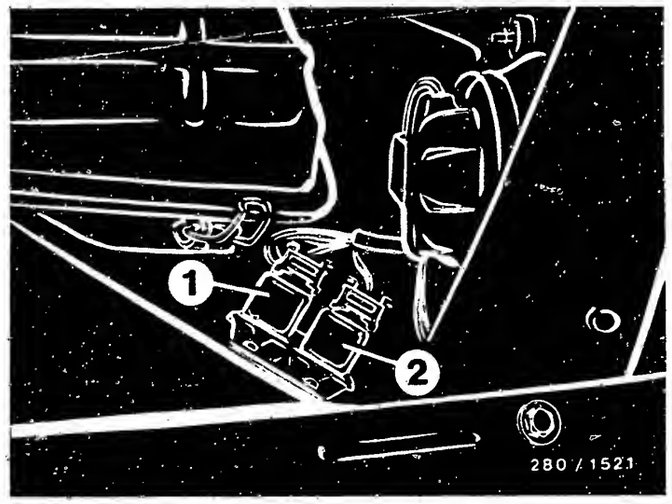
* Heated lambda sensor:
  In the exhaust pipe before the catalytic converter.

* Auxiliary-air device:
  On the right-hand side behind the intake-manifold passages.

* Tank-ventilation valve (driven by vacuum):
  Beneath the actived carbon canister.







Trouble-shooting instructions : FIA-5005

BOSCH system : Mono-Jetronic

Make of vehicle : FIAT / LANCIA

Basic microcard : KFZ-00.

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SPECIAL FEATURES

These trouble-shooting instructions, valid at the time of publication, apply to the following vehicle models:

Fiat with 0.999 l/ 4-cyl. engine:			
Panda 1000 i.e.		A,CH,D,S	10.87->
Panda 4x4 i.e.		A,CH	10.87->
Uno 45 i.e.		A,CH,D,S	10.87->
Lancia Y10 i.e.	4WD	A,CH	10.87->
Lancia Y10 i.e.		A,CH,D,S	10.87->
Fiat with 1.108 l/ 4-cyl. engine:			
Panda 1100 i.e.		EU	1.90->
Uno 45 i.e.		EU	1.90->
Lancia Y10 i.e.		EU	3.89->

* Mono-Jetronic with 25-pole control unit:
  0 280 000 710, 0 280 000 715, 0 280 000 732
  Engine-speed triggering by means of term. 1 signal from ignition coil.
* Adaptive lambda closed-loop control with lambda sensor.
* Throttle-valve positioner with idle contact for idle-speed regulation.
  Adjustment of assignment screw at throttle-plate lever, see PKW-135.
* Pump relay for in-tank fuel pump.
* For testing fuel pressure, make use of pressure gauge KDJE-P100/17 and hoses of pressure measuring device.
  Connect up 3-way line KDJE-P 100/13 between fuel inlet line and throttle-body injection unit.
* Load-dependent flushing of active-carbon container by way of pulsed tank-ventilation timing valve and switching valve.
* 2-pole plug on control unit for Fiat diagnosis tester.
  No flashing code.

* Vehicles with no catalytic converter are equipped with a lead-tolerant lean sensor (4-pole).
  This sensor supplies a voltage of approx. 20...40 mV in the lean range (lambda 1.2) in addition to the voltage step change (approx. 0.1/0.8 V) with lambda 1.0.
  The engine is thus regulated at part load.

SPECIAL FEATURES (CONTINUED)

Attention is to be paid to the following items so as to avoid damage to the throttle-body injection unit.

* The assignment screw (at the bottom of the throttle-plate lever) is not to be used for adjusting the idle speed. It serves to set the position of the throttle valve with respect to the throttle-valve positioner. This is only necessary when renewing the throttle-valve section or the throttle-valve positioner.

* Do not turn stop screw (minimum stop) of throttle valve as otherwise the control unit detects a fault. Screw is permanently set and secured against being turned.

* Do not actuate idle contact with throttle valve deflector (part and full-load range). This could cause the throttle-valve positioner to block.

* Do not loosen screws of pressure regulator. Do not exert pressure on upper section, as this may alter the fuel pressure.

* Do not adjust throttle-valve potentiometer. There is no service potential for checking assignment of throttle-valve position (angle) with respect to potentiometer.

STRUCTURE AND USAGE

These brief instructions encompass essentially vehicle-specific special features and test specifications (set values).

In accordance with the customer complaint, the trouble-shooting chart leads to different causes/component faults.
For a detailed description of trouble-shooting, see the information in the trouble-shooting chart of the basic instructions.

ATTENTION: Even if reference is made to basic instructions, the set values, terminal assignments and special features of these vehicle-related brief instructions are always binding.

Identical test-step numbering makes it easier to find individual test steps in the brief and basic instructions.

SAFETY AND PRECAUTIONARY MEASURES

In order to keep persons out of danger and to avoid damage to the engine, trigger boxes and control units or to the ignition system, observe the information in the basic instructions.

CAUTION!
High-performance ignition system with dangerous primary and secondary voltages!

Touching voltage-carrying components or terminals may prove fatal (both on the primary and secondary sides).

* Avoid injection of fuel when testing the compression.
  To ensure this, disconnect pump relay.

For further precautionary measures, see brief instructions.

TROUBLE-SHOOTING CHART

Customer complaint (fault symptoms)

1. Starting motor operates, engine fails to start or starts only with difficulty.	2. Engine starts but then dies.	3. Idle problems (engine speed, exhaust gas).	4. Poor throttle take-up, flat spot during acceleration.	5. Engine missing (ignition, injection).	6. Maximum engine power/top speed not reached.	7. Fuel consumption too high.	8. Engine running on.	9. Engine pinging/knocking.	10. Engine overheating.	11. Fault lamp.	Cause (component fault)
*	*	*	*	*	*	*			*		Universal test adapter
*	*	*	*		*						Air intake system
				*	*						Fuel delivery
*	*	*	*		*	*	*				Fuel pressure, leakage
		*		*	*	*	*				Solenoid-operated injection valve
				*							Alternator, interference suppression
*	*	*				*					Start control
				*		*					Overrun cutoff
		*	*	*		*					Engine-speed, CO-adjustment
		*	*	*		*					Lambda closed-loop control
					*						Exhaust-gas catalytic converter
		*	*				*				Tank ventilation

For production reasons:
continued on the following coordinate.

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01
Adapter lead: 1 684 463 170

Test step	Switch V	Switch Ω	Termi-nals	Testing of component/function	Test instructions/ Test conditions	Set values
1	5	–	1 – 5 (+) (–)	Term. 1 signal from ignition coil term. 1	Transmission in neutral, start	Ignition pulses on oscilloscope
2	6	–	4 – 5 (+) (–)	Voltage supply of control unit		8...15 V
3	7	–	9 – 5 (+) (–)	Voltage supply via main relay	Switch on ignition	8...15 V
4	8	–	17 – 5 (+) (–)	Simulated actuation Electric fuel pump	Switch on ignition Press button 3	Electric fuel pump runs, check by listening
5	8	–	17 – 5 (+) (–)	Pump relay	Switch on ignition	8...15 V
6	9	–	15 – 5 (+) (–)	A/C readiness (if provided)	Switch on ignition, switch on A/C	8...15 V
7	10	–	16 – 5 (+) (–)	A/C compressor (if provided)	Switch on ignition, switch on A/C	8...15 V
8	12	–	12 – 5 (+) (–)	Tank-ventilation timing valve	Switch on ignition Press button 4	Timing valve must be energized, check by listening
9	–	–	–	Not applicable		
10	–	–	–	Not applicable		
11	| V	7	3 – 5	Thr.-valve positioner Idle contact	Ignition "OFF" Accelerator pedal in off-position : Depress accelerator pedal somewhat:	0...10 Ω infinity Ω

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01 (continued)
Adapter lead: 1 684 463 170

Test step	Switch V	Switch Ω	Termi-nals	Testing of component/function	Test instructions/ Test conditions	Set values
12	| V	8	6 – 5	Ground connection (transmission switch)	Ign. "OFF", manual shift lever arbitrary, automatic P/N: Automatic Drive:	0...10 Ω infinity Ω
13	–	–	–	Not applicable		
14	–	–	–	Not applicable		
15	| V	11	14 – 5	Temperature sensor (intake air)	Ambient temperature +15...30 °C : at approx.+50°C:	1.45...3.3 kΩ 700 ...950 Ω
16	| V	12	2 – 5	Temperature sensor (engine)	Ambient temperature +15...30 °C : Engine at operating temperature approx. +80 °C :	1.45...3.3 kΩ 280...360 Ω
17	| V	13	25 – 5	Ground connection Output stage		0...10 Ω
18	| V	14	13 – 5	Solenoid-operated inj. valve and series resis.		6...12 Ω
19	| V	15	8 – 5	Throttle-valve potentiometer		600...1400 Ω
20	| V	16	7 – 18	Throttle-valve potentiometer	Deflect throttle valve (maximum value at part load)	400...4000 Ω
21	| V	20	23 – 24	Throttle-valve positioner		4...250 Ω

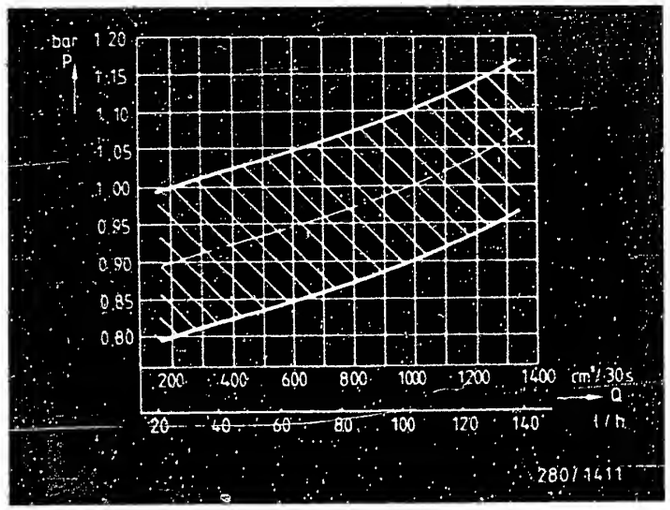
NOTE: The following components with the corresponding connecting leads are not covered by the universal test adapter in the course of testing:
1. Lambda sensor with heater
2. Tank-ventilation switching valve.

J09 — <⟹>

J10 — <⟸

TEST SPECIFICATIONS

Component/function	Set values
Electric fuel pump	
* Delivery at return:	min. 550 cm ^{3} /30s
* Supply voltage under load:	min. 12 V
Pressure regulator	
* Fuel pressure with engine stopped:	see diagram
Solenoid-operated injection valve	
* Internal resistance between t. 2 and t. 3 at ambient temperature +15...+30 °C :	1,0...1,6 Ω
* Leakage after 60 s:	a max. of one droplet may drip off
Series resistor	
* Internal resistance:	2,5...4,0 Ω
Throttle-valve potentiometer	
* Internal resistance between t. 5 and t. 1 :	600...1400 Ω
t. 4 and t. 2:	400...4000 Ω
Deflect throttle valve (maximum value at part load)	
Throttle-valve positioner	
* Internal resistance between t. 1 and t. 2 :	4...250 Ω
* Idle contact t. 3 and t. 4:	0...0,5 Ω
Lambda sensor heater	
* Internal resistance (PTC) with engine stopped:	1...15 Ω

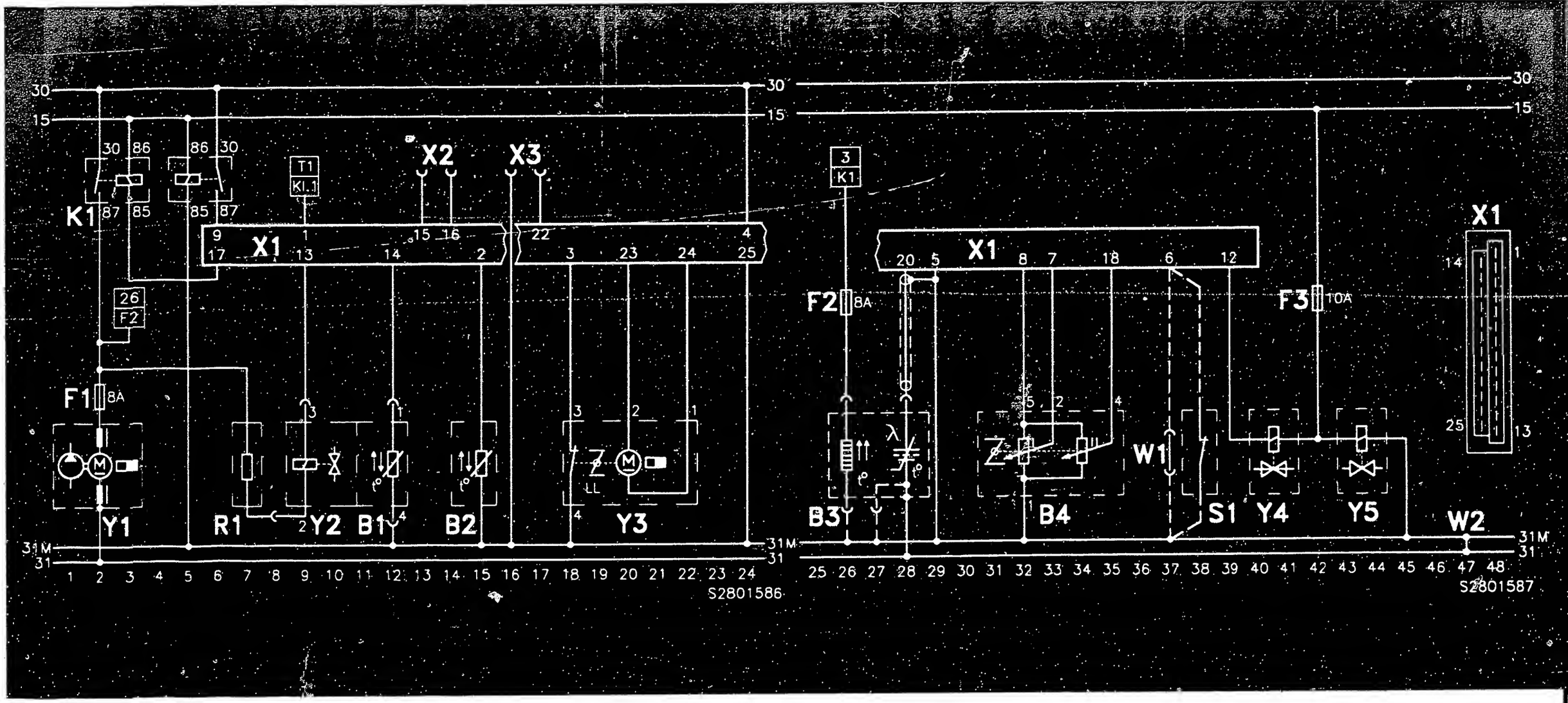


Q = Fuel delivery of electric fuel pump
p = Primary pressure

Component/function	Set values
Temperature sensor (engine)	
* Internal resistance	
at ambient temperature	
+15...+30 °C :	1,45...3,3 k Ω
with engine at operating	
temperature approx. +80 °C :	280...360 Ω
Temperature sensor (intake air)	
* Internal resistance	
between t. 1 and t. 4	
at ambient temperature	
+15...+30 °C :	1,45...3,3 k Ω
at approx. +50°C :	700...950 Ω
Start control	
* Voltage at injection valve	
Start initiation	greater than 1,0 V
after approx. 15s:	approx. 0,3 V
Tank-vent. timing valve and	
tank-vent. switching valve	
* Internal resistance	
at ambient temperature	
+15...+30 °C, timing valve :	35...55 Ω
Switching valve, non-Bosch :	15...35 Ω
Idle	
Engine at operating temperature	
approx.+80°C	
* Idle speed:	800...900 min $^{-1}$
* Lambda sensor voltage	
Exhaust gas "lean":	0,05...0,3 V
Exhaust gas "rich":	0,60...1,0 V
Idle speed and lambda closed-	
loop control cannot be adjusted	
(adaptive regulation)	

Component/function	Set values
Lean sensor	
(only for vehicles with no	
catalytic converter)	
* Lambda sensor voltage	
Voltage step change,	
lambda 1.0	
Exhaust gas "lean":	0,02...0,3 V
Exhaust gas "rich":	0,60...1,0 V
Lean range, lambda approx. 1.2	
Disconnect sensor plug and	
connect digital multimeter to	
grey and black lead. Heating	
remains connected.	
Effect leaning of exhaust gas,	
e.g. by detaching a vacuum hose	
at injection unit.	
* Sensor voltage	
Lean value:	20...40 mV

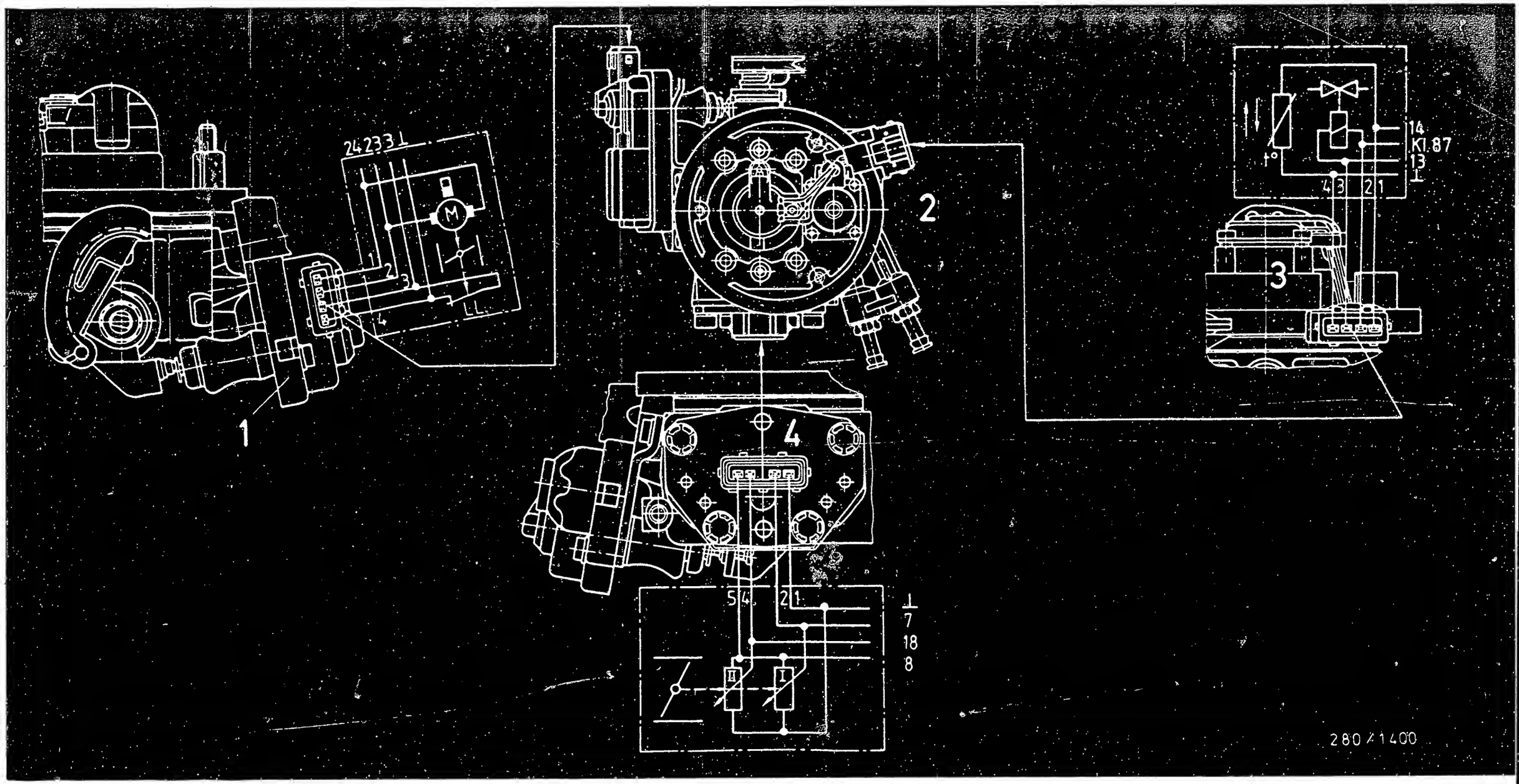
See equipment and Autodata microcard for settings as regards ignition, valve clearance and other engine-related data.



ELECTRICAL TERMINAL DIAGRAM

B1 = Temperature sensor (intake air)
B2 = Temperature sensor (engine)
B3 = Lambda sensor, heated (in some cases lean sensor, 4-pole)
B4 = Throttle-valve potentiometer
F1 = Fuse (fuel pump)
F2 = Fuse (sensor heater)
F3 = Fuse
K1 = Pump relay
K2 = Main relay
R1 = Series resistor
S1 = Drive switch (automatic transmission only)
T1 = Ignition coil
W1 = Jumper (manual transmission only)
W2 = Ground strap, engine
X1 = Control-unit plug
X2 = Plug for A/C
X3 = Diagnosis plug for Fiat diagnosis tester
Y1 = Electric fuel pump
Y2 = Solenoid-operated injection valve
Y3 = Throttle-valve positioner
Y4 = Tank-ventilation timing valve
Y5 = Tank-ventilation switching valve

J15 — ⟹
J16 — ⟺

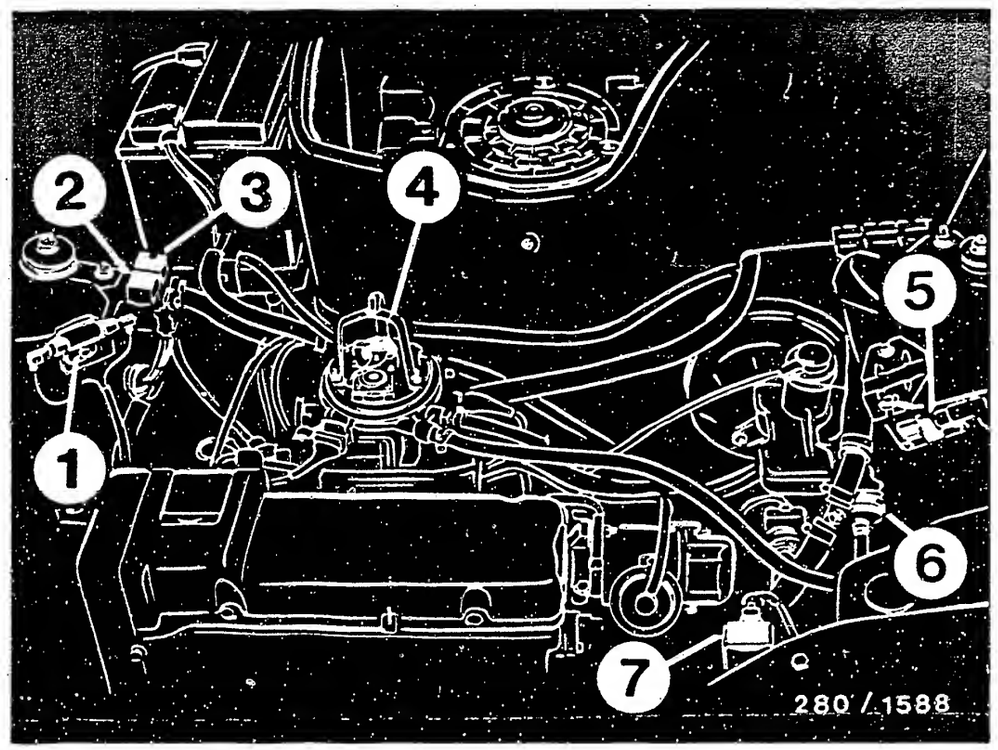


PLUG ASSIGNMENT OF THROTTLE-BODY INJECTION UNIT

1 = Throttle-valve positioner with idle contact
2 = Throttle-body injection unit
3 = Solenoid-operated injection valve and temperature sensor (intake air)
4 = Throttle-valve potentiometer

J17 — <⟹>

J18 — <⟸

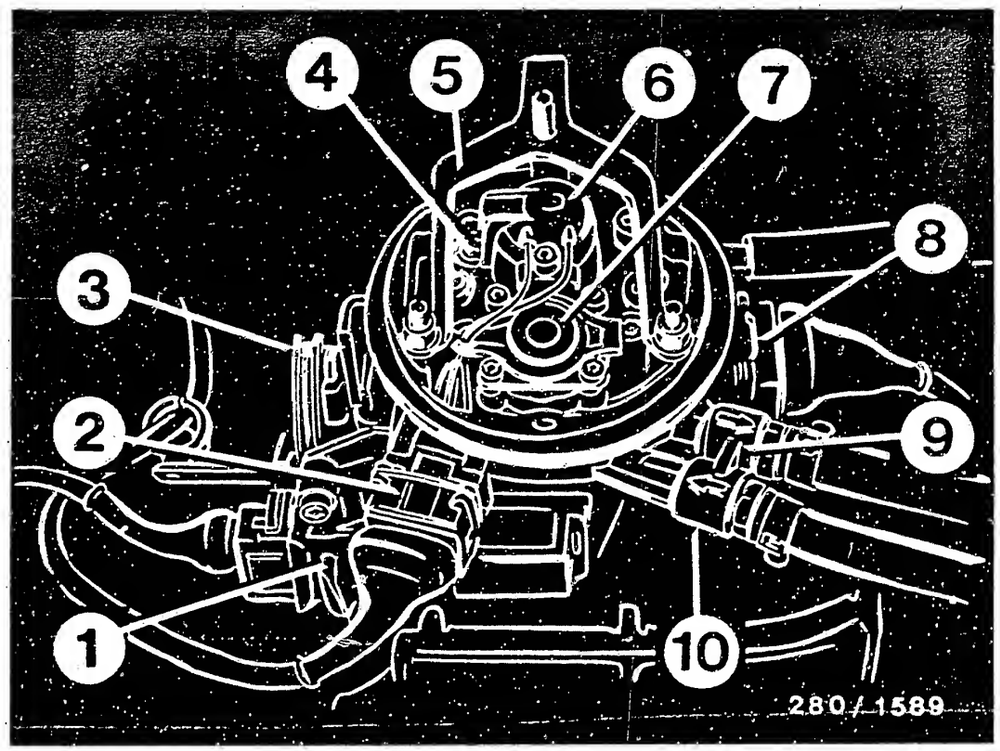


1 = Series resistor
2 = Main relay
3 = Pump relay
4 = Throttle-body injection unit
5 = Ignition coil
6 = Fuel filter
7 = Tank-ventilation switching valve (non-Bosch)

INSTALLATION POSITION OF COMPONENTS

All installation locations refer to the direction of travel.

Arrangement of components in engine compartment. Air filter and spare wheel have been removed in the picture.



1 = Throttle-valve positioner
2 = Quadruple plug for injection valve and temperature sensor (intake air)
3 = Pulley wheel
4 = Temperature sensor (intake air)
5 = Bracket for air-filter attachment
6 = Solenoid-operated injection valve
7 = Pressure regulator
8 = Throttle-valve potentiometer
9 = Fuel return line
10 = Fuel inlet line

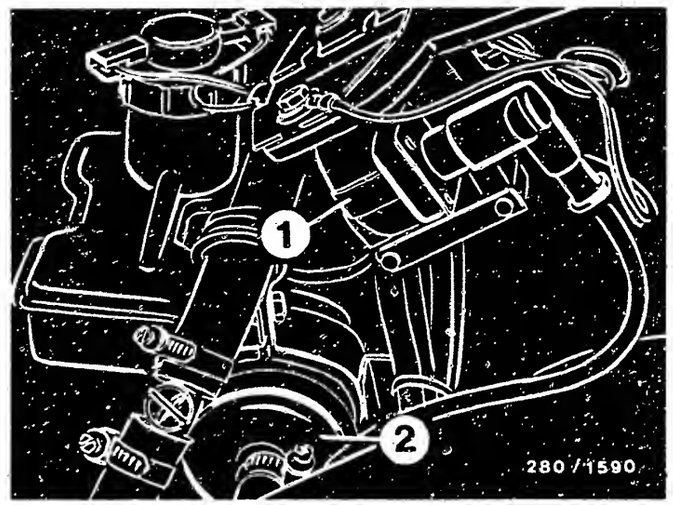
INSTALLATION POSITION OF COMPONENTS (CONTINUED)

* The control unit is mounted on the passenger's side behind the glove compartment or in the centre console.

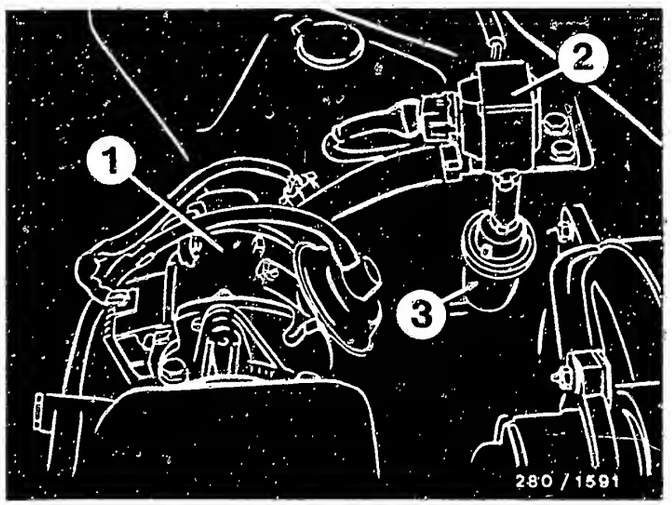
* The in-tank electric fuel pump is installed in the fuel tank. It is accessible under the seat bench after lifting the bench.

* The lambda sensor is screwed into the twin exhaust pipe at the front of the engine.

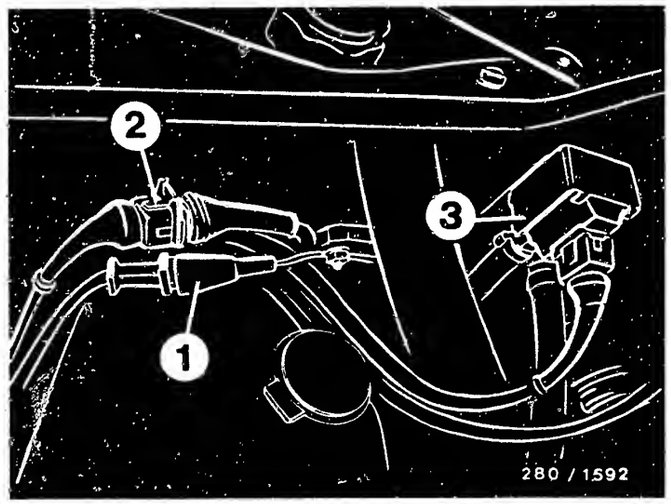
* Top picture
  1 = Ignition coil
  2 = Fuel filter



* Center picture
  1 = Ignition distributor
  2 = Tank-ventilation switching valve (non-Bosch)
  3 = Tank-ventilation timing valve



* Bottom picture
  1 = Plug connection for lambda sensor signal
  2 = Plug connection for sensor heater
  3 = Tank-ventilation switching valve



Further installation positions

* The central ground of the Monojetronic is fitted on the underside at the rear of the engine block.

* The temperature sensor (engine) is bolted to the rear left of the cylinder head.

* A 2-pole diagnosis plug for connecting up the Fiat diagnosis tester is located at the control unit.

T A B L E O F C O N T E N T S

Trouble-shooting instructions : OPE-5001

BOSCH system : Ecotronic (2 Z)

Make of vehicle : OPEL

Basic microcard : KFZ-00..

SPECIAL FEATURES

* This microcard contains the ECO2Z trouble-shooting instructions, valid at the time of publication, for the following Opel models:

Omega 1.8 S	(10.86->)
with engine	
S 18 NV and E 18 NV	(->06.88)
E 18 NVR	(07.88->)

* Ecotronic with integral characteristic-map ignition with 35-pin control unit.
System version:
ECO 2Z for engine S18 NV/E 18 NV
ECO 2.1Z for engine E 18 NVR

* The control unit is equipped with self-diagnosis. If a fault should arise in the system, it is stored in the fault memory. At the same time, the warning/diagnosis lamp in the instrument panel lights up.
If a sensor fails, the control unit operates with specified substitute values.

ECO 2.1Z:

* Coolant temperature sensor only
* Extended self-diagnosis

STRUCTURE, USAGE

These brief instructions encompass essentially vehicle-specific special features and test specifications (set values).

In accordance with the customer complaint, the trouble-shooting chart leads to various causes/component faults.
Detailed instructions for trouble-shooting must be taken from the basic instructions via the trouble-shooting chart.

ATTENTION: Even if reference is made to basic instructions, the set values, terminal assignments and special features of these vehicle-related brief instructions are always binding.

Finding individual test steps in the brief and basic instructions is made easier through the use of identical test-step numbers.

SAFETY AND PRECAUTIONARY MEASURES

In order to keep persons out of danger and to prevent damage to the engine, control unit or ignition system, be sure to observe the safety and precautionary measures in the basic instructions.

* C A U T I O N !
  High-performance ignition system.
  Dangerous primary and secondary voltages.

  Touching voltage-carrying components or terminals may prove fatal (both on the primary and secondary sides).

For further precautionary measures, see basic instructions.

TROUBLE-SHOOTING CHART

Customer complaint (symptoms of trouble)

1. Starting motor operates, but engine fails to start or starts only with difficulty.	2. Engine starts but then dies.	3. Rough idling (engine speed, exhaust gas).	4. Poor throttle response, flat spot during acceleration.	5. Engine misfiring (ignition, fuel induction).	6. Maximum engine power/ top speed not reached.	7. Fuel consumption too high.	8. Engine running on (dieseling).	9. Engine pinging/knocking.	10. Engine overheating.	11. Fault lamp.	Cause (component fault)
*	*	*	*	*	*	*	*	*	*	*	Evaluate self-diagnosis
										*	Fault lamp defective
*			*	*							Engine-speed/reference-mark sensor
*											Test primary side
*		*	*	*	*	*					Test secondary side
								*	*		Poor fuel quality
*			*	*	*						Fuel pressure
	*			*	*						Fuel filter
*	*	*	*	*	*	*					Choke-valve flap
*	*			*	*						Float/float-needle valve
*	*	*	*	*	*						Dirt in carburetor
	*	*	*	*	*						Intake system leaking
	*	*									Intake-manifold heating
	*	*									Intake-air preheating
				*							Alternator, interference-suppress.
		*	*								Bypass heating

TROUBLE-SHOOTING CHART (continued)

Customer complaint (symptoms of trouble)

1. Starting motor operates, but engine fails to start or starts only with difficulty.	2. Engine starts but then dies.	3. Rough idling (engine speed, exhaust gas).	4. Poor throttle response, flat spot during acceleration.	5. Engine misfiring (ignition, fuel induction).	6. Maximum engine power/ top speed not reached.	7. Fuel consumption too high.	8. Engine running on (dieseling).	9. Engine pinging/knocking.	10. Engine overheating.	11. Fault lamp.	Cause (component fault)
	*				*						Adjustment, throttle valve Stage I
	*	*	*	*	*						Incorrect type of nozzle
		*		*							Vacuum unit, Stage II
	*	*		*							Adjustment, throttle valve Stage II
	*	*									Exhaust-gas recirculation
		*		*	*						Adjustment, accelerator actuation
	*										Idle CO adjustment
	*	*									Throttle valve worn
							*	*			Test octane-rating adaptation
		*									Release and forced return
						*					Catalytic converter (if fitted)

For production reasons: continued on the following coordinate.

SELF-DIAGNOSIS TEST TABLE

Fault display Flashing code	Testing of component/function	Test instructions/test conditions	Terms.	Set values
1 2	Control-unit diagnosis output	Control unit indicates that it is in diagnosis mode.	30	——
1 4	Coolant temperature sensor (short to ground)	Resistance of temperature sensor: at 20°C at 80°C	13 23 13 23	2...3 k Ω 280...360 Ω
1 5	Coolant temperature sensor (open circuit)			
1 9 *)	Invalid fault code	Fault code may be constantly present in fault memory although there is no fault present. Ignore fault code if it is read out.	——	——————
2 1 *)	Throttle-valve potentiometer (short to supply voltage)	Resistance, potentiometer, throttle valve and throttle-valve positioner (parallel): Wiper resistance, throttle-valve potentiometer: Allow engine to idle. Seal off vent side of throttle-valve positioner. Switch off engine. Switch on ignition.	9 6	0,7...1,3 k Ω
2 2	Throttle-valve potentiometer (short to ground/ open circuit)	Accelerator pedal at idle: Accelerator pedal in full-throttle position: Constant change in resistance between min. and max.	7 6 7 6 7 6	min. < 270 Ω max. 1,4...2,4 k Ω max. 1,4...2,4 k Ω
3 6 *)	RON - encoding (short to ground)	Resistance of octane-number plug Fault code is set if RON encoding changes from status on starting.	25 16	91 RON infinity Ω 95 RON 0 Ω

*) Fault code is contained on Omega 1.8 S with engine E 18 NVR.

SELF-DIAGNOSIS TEST TABLE

Fault display Flashing code	Testing of component/function	Test instructions/test conditions	Terms.	Set values
4 1	Intake-manifold temperature sensor (short to ground)	Resistance of temperature sensor: at 20 °C at 80 °C	13 23 13 23	2...3 k Ω 280...360 Ω
4 2 *)	Primary current too high	Ignition coil, resistance, primary side secondary side	1 19 ———	approx. 0,7 Ω 6,9...11 k Ω
4 3	Intake-manifold temperature sensor (open circuit)	Resistance of temperature sensor: at 20 °C at 80 °C	13 23 13 23	2...3 k Ω 280...360 Ω
4 8	Supply voltage too low	at 80 °C	4 5 + −	> 10 V
4 9	Supply voltage too high	Check alternator/regulator at 80 °C	4 5 + −	< 15 V
5 1 / 5 5 *)	Control unit defective	Once all faults have been read out: Clear fault memory. Run engine briefly. Repeat self-diagnosis output. Renew control unit if fault is indicated again.	—	———
5 3	Potentiometer in throttle-valve positioner (open circuit)	Resistance, potentiometer, throttle valve and throttle-valve positioner (parallel):	9 6	0,7...1,3 k Ω
5 4	Potentiometer in throttle-valve positioner (short to ground)	Wiper resistance, potentiometer in throttle-valve positioner: (actuate evacuation valve in throttle-valve positioner during test and pull back throttle-valve positioner with vacuum hand pump). Constant decrease in resistance.	28 6 26 6	min. < 400 Ω max. 1,4...2,6 k Ω

*) Fault code is contained on Omega 1.8 S with engine E 18 NVR.

SELF-DIAGNOSIS TEST TABLE (continued)

Fault display Flashing code	Testing of component/function	Test instructions/test conditions	Terms.	Set values
5 6	Choke-valve actuator current too high	Insulation resistance of choke-valve actuator:	14 5	> 1 M Ω
5 7	Choke-valve actuator current too low	Winding resistance of choke-valve actuator:	14 15	0,9...1,7 Ω
5 8	Input for CO adjustment (short to ground)	Insulation resistance, input, CO adjustment:	10 5	> 1 M Ω
5 9	Throttle-valve positioner extends too slowly	Fault only indicated if engine running at idle during diagnosis output.	14 5	> 1 M Ω
6 1	Throttle-valve positioner retracts too slowly	Switch off engine and check retraction/extension time of throttle-valve positioner: retraction time: extension time:	—— ——	max. 1 s max. 1 s
6 2 *)	Throttle-valve positioner Vent valve, intervention time too long			
6 3 *)	Throttle-valve positioner, evacuation valve Intervention time too long			
6 4 *)	Primary current too low	Ign. coil Resistance primary side secondary side	1 19 ——	appr. 0,7 Ω 6,9...11 k Ω

*) Fault code contained on Omega 1.8 S with engine E 18 NVR.

TEST SPECIFICATIONS:

Idle speed:	780...880 min-1
with idle-speed increase	880...980 min-1
CO adjustment:	
CO value with engine at normal operating temperature	0,2...0,3 % CO by vol.
With CO adjustment plug plugged in	0,5...1,5 % CO by vol.
Fuel pressure:	0,1...0,3 bar
Minimum fuel delivery (at 2000 min-1)	1 l/min
Float weight:	8,0...8,6 g
Float height:	26,5...28,5 mm

(Float level cannot be adjusted

Throttle-valve potentiometer

Total resistance:	1,4...2,6 k Ω
Wiper resistance in correcting range: min.	less than 270 Ω
max.	1,4...2,4 k Ω

Choke-valve actuator:

Winding resistance:	0,9...1,7 Ω
Basic setting, throttle valve Stage II:	a = 0,03...0,07 mm
Release and forced return Stage II:	Y = 0,1...0,7 mm
	Z = 0,3...0,5 mm
Tightening torques Flange mounting	9 Nm

TEST SPECIFICATIONS (continued):

Throttle-valve actuator

evacuating valve (term.1/term.2):	20...70 Ω
ventilating valve (term.6/term.7):	20...70 Ω
Total resistance, potentiometer (term.3/term.4):	1,4...2,6 k Ω
Wiper resistance in correcting range (term.5/term.3):	
min.	less than 400 Ω
max.	1,4...2,4 k Ω
Inductive engine-speed and reference-mark sensor:	
Internal resistance	0,5...0,8 k Ω
Temperature sensor (NTC):	
Internal resistance at 20°C:	2...3 k Ω
at 80°C:	280...360 Ω
Heating element, intake-manifold heating:	
Internal resistance at 20°C:	0,6...0,7 Ω
Heating element, bypass heating:	
Internal resistance at 20°C:	1,4...2.1 Ω

Type of nozzle:

	Stage 1	Stage 2
Main nozzle	x 110	x 135
Idle fuel nozzle	x 52,5	
Air-correction nozzle	x 110	x 70

Coding plug, octane-rating adaptation:

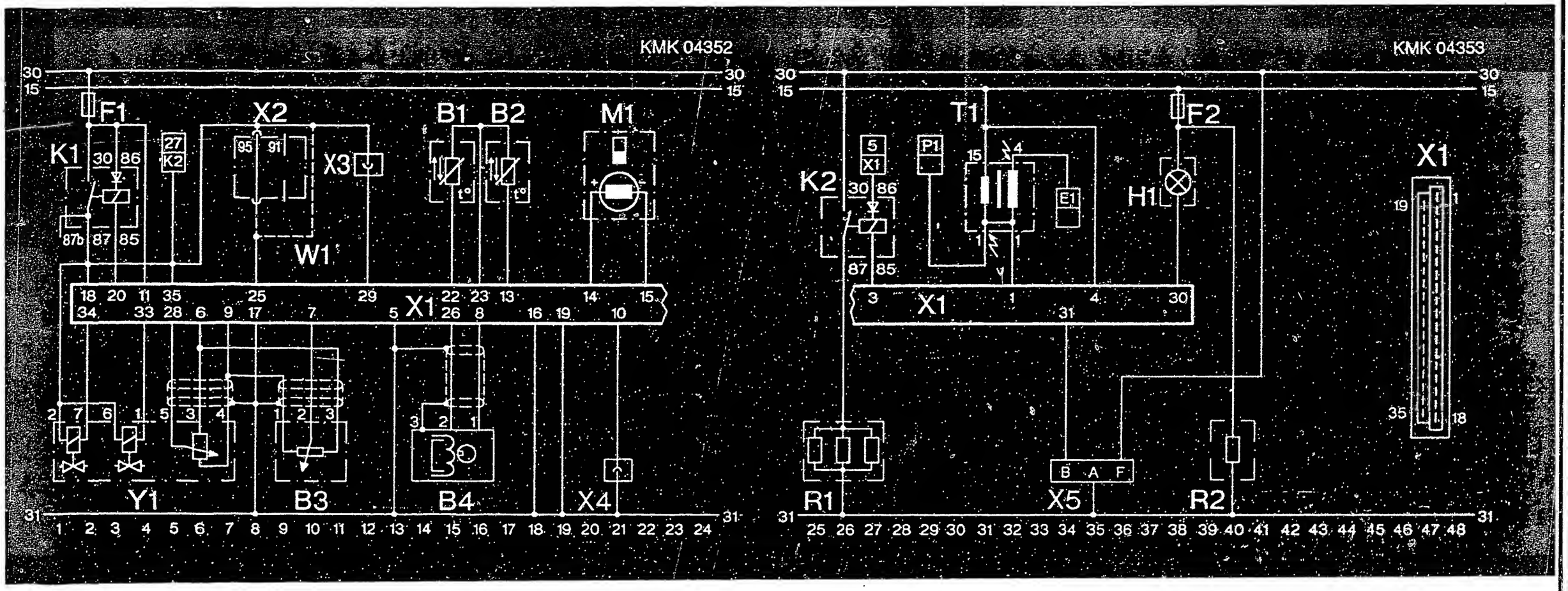
Resistance at:

91 RON:	infinity Ohms
95 RON:	0 Ω

Voltage supply for potentiometer (throttle valve and throttle-valve actuator) and temperature sensor:

4,5...5,5 V

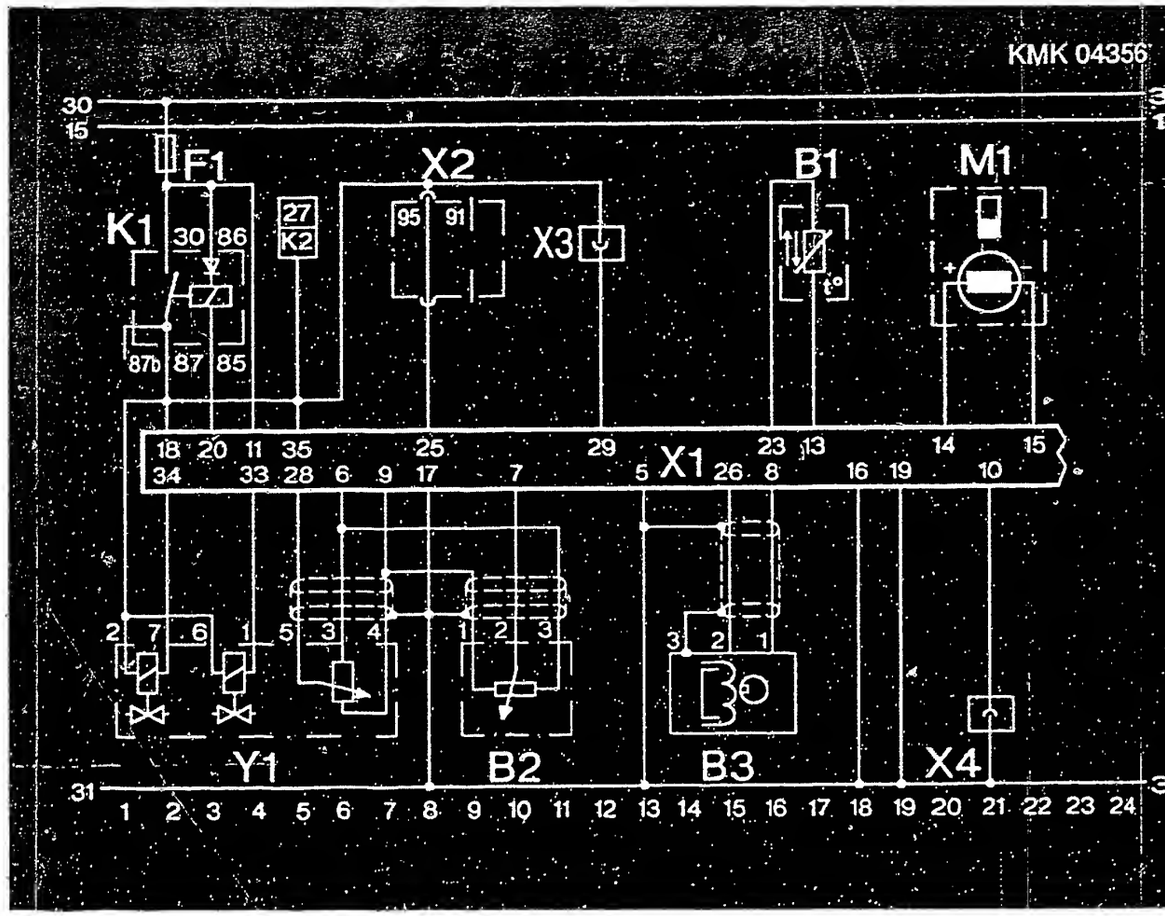
See equipment and Autodata microcards for the setting values for valve clearance and other engine-related data.

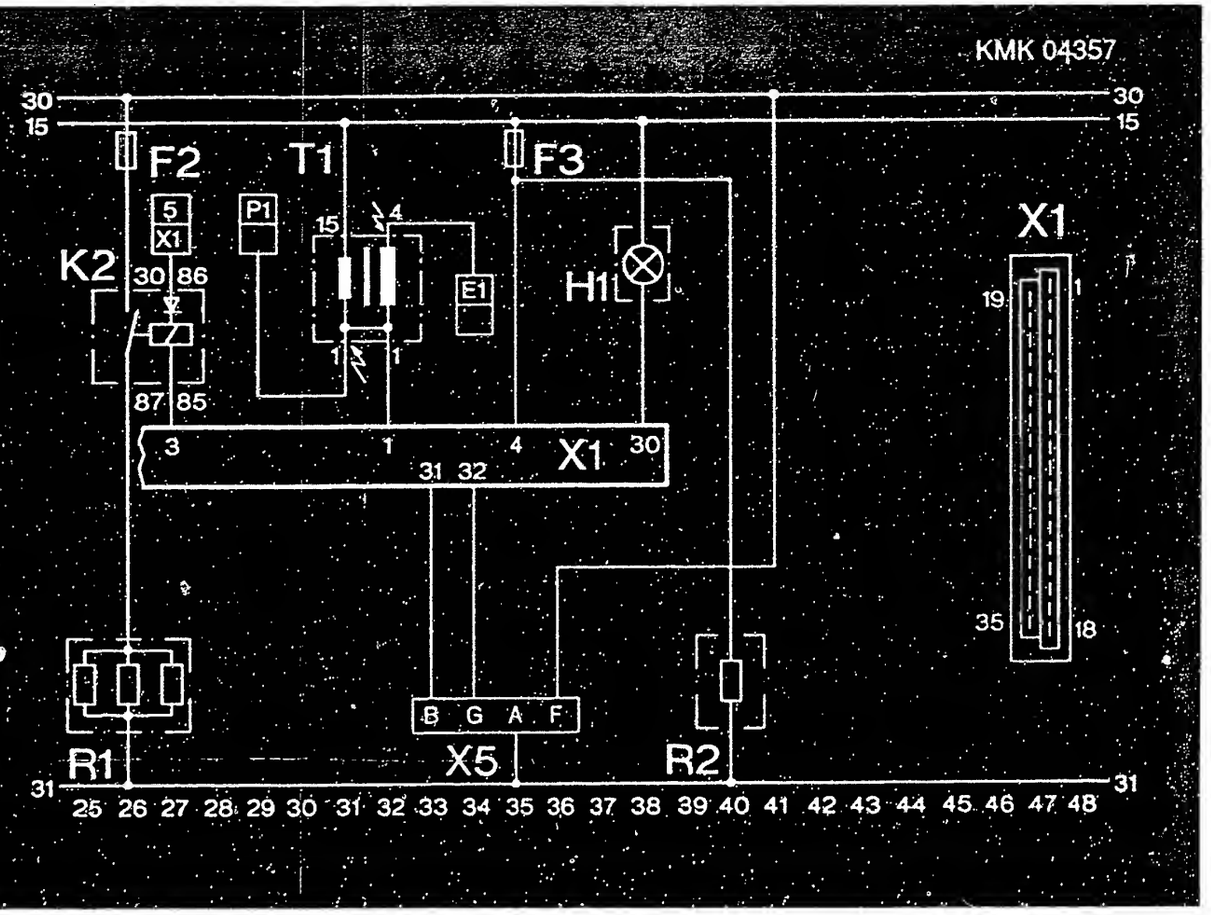


ELECTRICAL TERMINAL DIAGRAM

Engine E 18 NV / S 18 NV:

B1 = Intake-manifold temperature sensor
B2 = Coolant temperature sensor
B3 = Throttle-valve potentiometer
B4 = Engine-speed/reference-mark sensor
F1 = Fuse, control unit
F2 = Fuse, carburetor preheating
H1 = Diagnosis lamp
M1 = Choke-valve actuator
K1 = Main relay
K2 = Relay, intake-manifold heating
R1 = Intake-manifold heating
R2 = Carburetor preheating
W1 = Connection only on engine E 18 NV
X1 = Control-unit plug
X2 = Octane-number plug engine E 18 NV only
X3 = Connector, idle-speed increase
X4 = Connector, CO setting
X5 = Diagnosis plug
Y1 = Throttle-valve positioner

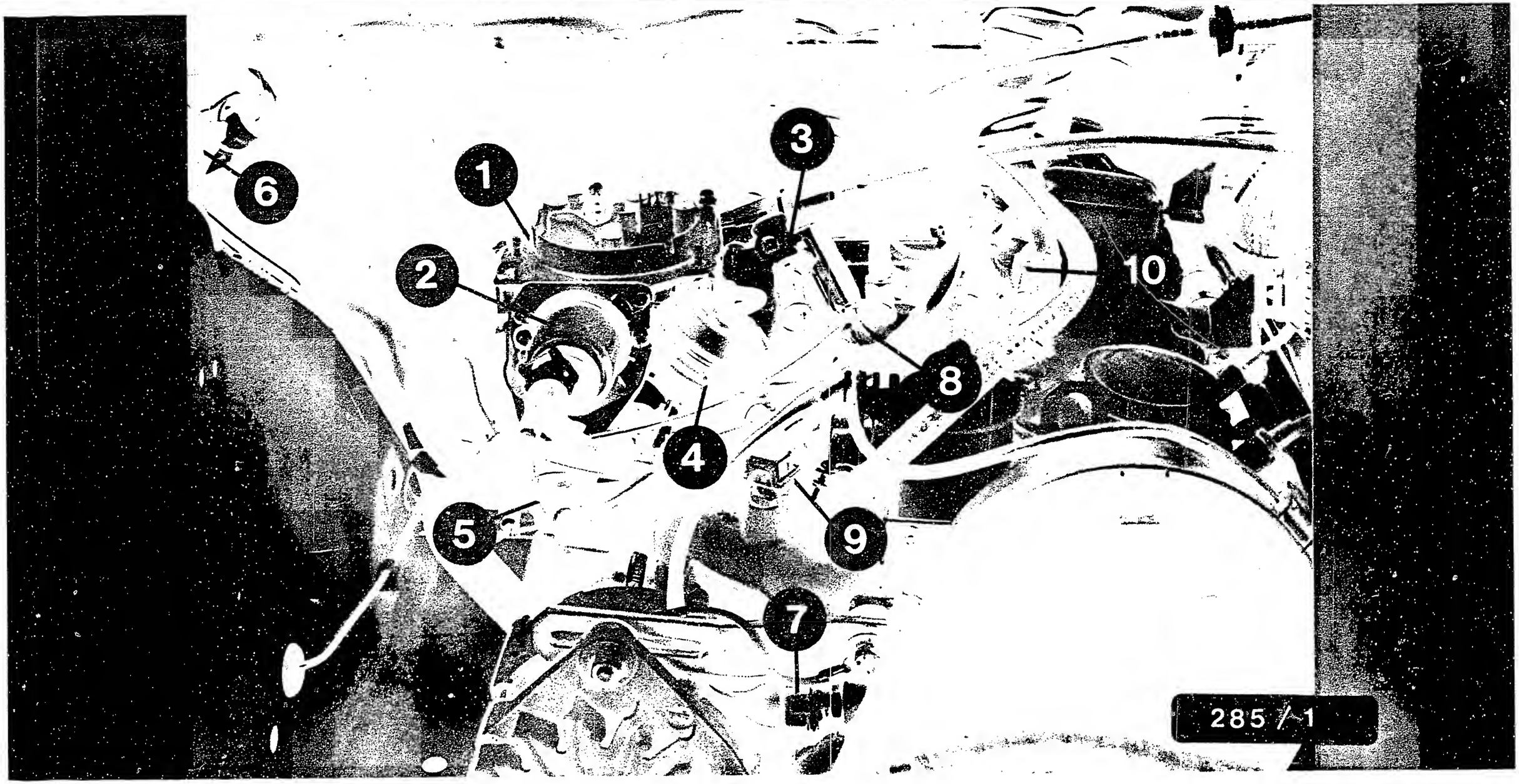




ELECTRICAL TERMINAL DIAGRAM

Engine E 18 NVR:

B1 = Coolant temperature sensor
B2 = Throttle-valve potentiometer
B3 = Engine-speed/reference-mark sensor
F1 = Fuse, control unit
F2 = Fuse, intake-manifold heating
F3 = Fuse, carburetor preheating
H1 = Diagnosis lamp
M1 = Choke-valve actuator
K1 = Main relay
K2 = Relay, intake-manifold heating
R1 = Intake-manifold heating
R2 = Carburetor preheating
X1 = Control-unit plug
X2 = Octane-number plug
X3 = Connector, idle-speed increase
X4 = Connector, CO adjustment
X5 = Diagnosis plug
Y1 = Throttle-valve positioner

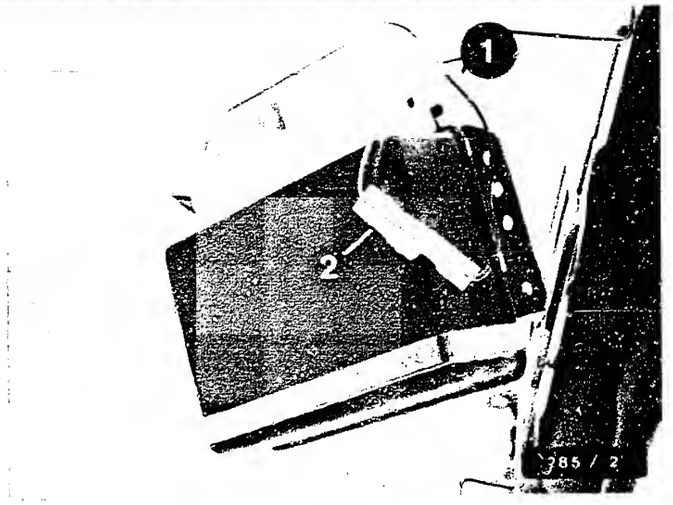


INSTALLATION POSITION OF COMPONENTS

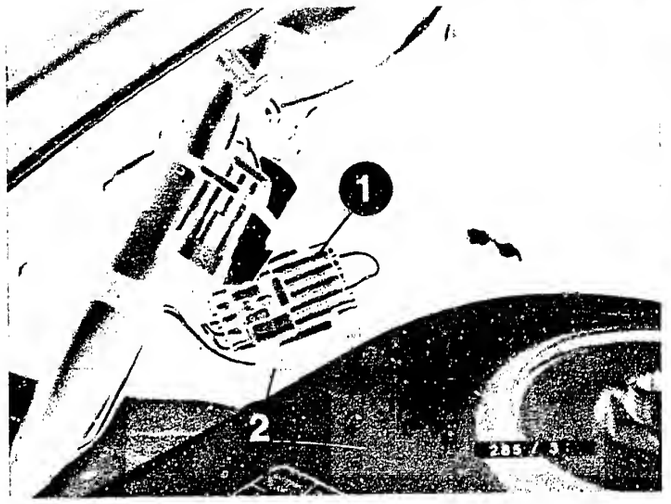
1 = Carburetor
2 = Choke-valve actuator
3 = Throttle-valve positioner
4 = Vacuum unit, stage 2
5 = Throttle-valve potentiometer
6 = Diagnosis plug
7 = Temperature sensor, coolant
8 = Exhaust-gas recirculation valve
9 = Temperature sensor, intake manifold
(only on engine S 18 NV/E 18 NV)
10 = Plug connection, reference-mark sensor

INSTALLATION POSITION OF COMPONENTS (continued)

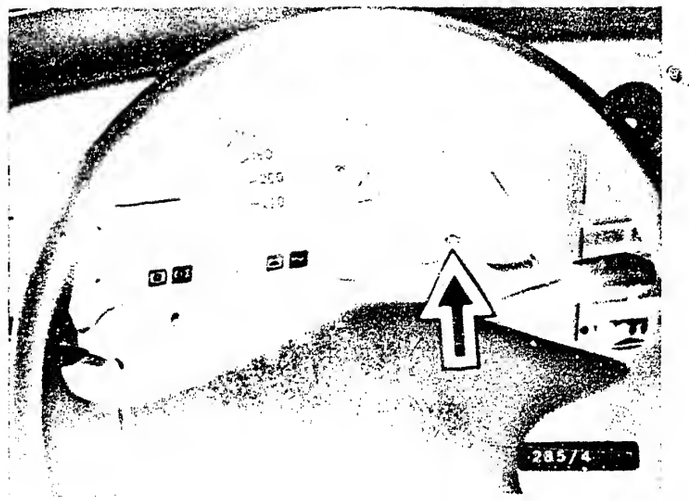
The Ecotronic control unit with integrated ignition is installed in the right footwell beneath the covering (upper illustration). In the illustration, the covering has already been removed. For the purposes of octane-number adaptation, in vehicles with the S 18 NV engine a code strip is located in the wiring harness (upper illustration, 1) and in vehicles with the E 1 NV engine a coding plug is installed in the engine compartment on the right behind the spring-strut dome.
The idle speed can be increased by about every 100 min. $^{-1}$ via the plug connection (upper illustration, 2).



The diagnosis plug is installed in the engine compartment on the firewall on the right (center illustration, 1).
Plug for CO adjustment (center illustration, 2).
If no CO tester is available with which it is possible to measure low CO values, make a plug connection for CO adjustment. The CO value is increased.

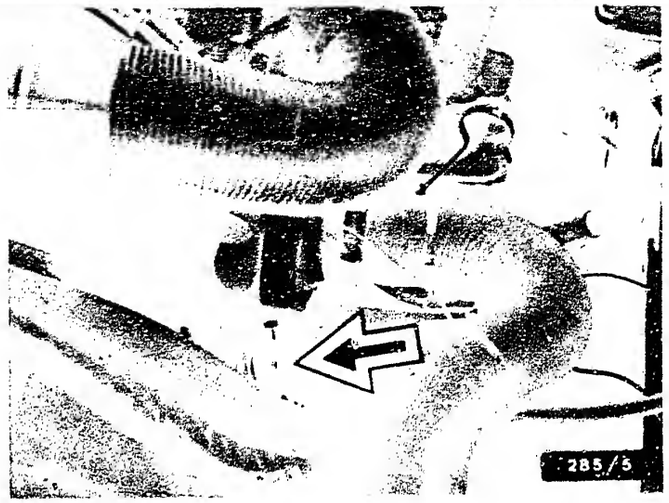


The warning and diagnosis lamp is installed in the instrument panel (lower illustration).

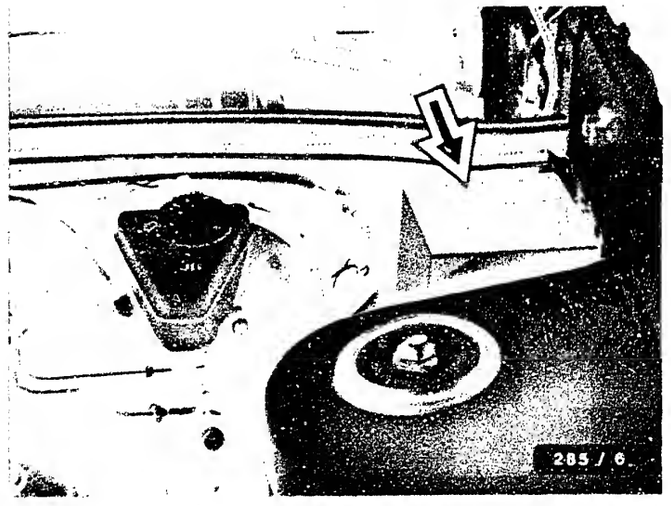


INSTALLATION POSITION OF COMPONENTS (continued)

The reference-mark and engine-speed sensor is mounted on the crankcase on the left as seen from the direction of travel (upper illustration, arrow).



The control relay and relay for intake-manifold preheating are installed beneath the cover (lower illustration, arrow).



T A B L E O F C O N T E N T S

Trouble-shooting instructions : OPE-5002

BOSCH system : Ecotronic (2 Z)

Make of vehicle : OPEL

Basic microcard : KFZ-00..

SPECIAL FEATURES

* This microcard contains the ECO2Z trouble-shooting instructions, valid at the time of publication, for the following OPEL-models:

  Ascona/Kadett 1.8 S (10.86->)
  with engine S 18 NV and E 18 NV

  Vectra 1.8 S /
  Vectra 1.8 S 4 x 4 (09.88->)
  with engine E 18 NVR

* Ecotronic with integrated ignition map with 35-pole control unit.
  System version:
  ECO 2Z on engine S 18 NV or E 18 NV
  ECO 2.1Z on engine E 18 NVR

* The control unit is equipped with self-diagnosis. If a fault occurs in the system it is stored in the fault memory. At the same time, the warning/diagnosis lamp in the instrument panel lights.
  The control unit employs specified substitute values should a sensor fail.

  ECO 2.1Z:

* Coolant temperature sensor only.
* Extended self-diagnosis.

STRUCTURE, USAGE

These brief instructions encompass essentially vehicle-specific special features and test specifications (set values).

In accordance with the customer complaint, the trouble-shooting chart leads to various causes/component faults.
Detailed instructions for trouble-shooting must be taken from the basic instructions via the trouble-shooting chart.

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Finding individual test steps in the brief and basic instructions is made easier through the use of identical test-step numbers.

SAFETY AND PRECAUTIONARY MEASURES

In order to keep persons out of danger and to prevent damage to the engine, control unit or ignition system, be sure to observe the safety and precautionary measures in the basic instructions.

* C A U T I O N !
  High-performance ignition system.
  Dangerous primary and secondary voltages.

  Touching voltage-carrying components or terminals may prove fatal (both on the primary and secondary sides).

For further precautionary measures, see basic instructions.

TROUBLE-SHOOTING CHART

Customer complaint (symptoms of trouble)

1. Starting motor operates, but engine fails to start or starts only with difficulty.	2. Engine starts but then dies.	3. Rough idling (engine speed, exhaust gas).	4. Poor throttle response, flat spot during acceleration.	5. Engine misfiring (ignition, fuel induction).	6. Maximum engine power/ top speed not reached.	7. Fuel consumption too high.	8. Engine running on (dieseling).	9. Engine pinging/knocking.	10. Engine overheating.	11. Fault lamp.	Cause (component fault)
*	*	*	*	*	*	*	*	*	*	*	Evaluate self-diagnosis
										*	Fault lamp defective
*			*	*							Engine-speed/reference-mark sensor
*											Test primary side
*		*	*	*	*	*					Test secondary side
							*	*			Poor fuel quality
*			*	*	*						Fuel pressure
	*			*	*						Fuel filter
*	*	*	*	*	*	*					Choke-valve flap
*	*			*	*						Float/float-needle valve
*	*	*	*	*	*						Dirt in carburetor
	*	*	*	*	*						Intake system leaking
	*	*									Intake-manifold heating
	*	*									Intake-air preheating
				*							Alternator, interference-suppress.
		*	*								Bypass heating

TROUBLE-SHOOTING CHART

Customer complaint (symptoms of trouble)

1. Starting motor operates, but engine fails to start or starts only with difficulty.	2. Engine starts but then dies.	3. Rough idling (engine speed, exhaust gas).	4. Poor throttle response, flat spot during acceleration.	5. Engine misfiring (ignition, fuel induction).	6. Maximum engine power/ top speed not reached.	7. Fuel consumption too high.	8. Engine running on (dieseling).	9. Engine pinging/knocking.	10. Engine overheating.	11. Fault lamp.	Cause (component fault)
	*				*						Adjustment, throttle valve stage I
	*	*	*	*	*						Incorrect type of nozzle
		*		*							Vacuum unit, stage II
	*	*		*							Adjustment, throttle valve stage II
		*		*	*						Adjustment, accelerator actuation
	*										Idle CO adjustment
	*	*									Throttle valve worn
							*	*			Test octane-rating adaptation
		*									Release and forced return
					*						Catalytic converter (if fitted)

For production reasons: continued on the following coordinate.

SELF-DIAGNOSIS TEST TABLE

Fault display Flashing code	Testing of component/function	Test instructions/test conditions	Terms.	Set values
1 2	Control-unit diagnosis output	Control unit indicates that it is in diagnosis mode.	30	—
1 4	Coolant temperature sensor (short to ground)	Resistance of temperature sensor: at 20°C at 80°C	13 23 13 23	2...3 k Ω 280...360 Ω
1 5	Coolant temperature sensor (open circuit)			
1 9 *)	Invalid fault code	Fault code may be constantly present in fault memory although there is no fault present. Ignore fault code if it is read out.	—	—
2 1 *)	Throttle-valve potentiometer (short to supply voltage)	Resistance, potentiometer, throttle valve and throttle-valve positioner (parallel): Wiper resistance, throttle-valve potentiometer: Allow engine to idle. Seal off vent side of throttle-valve positioner. Switch off engine. Switch on ignition.	9 6	0,7...1,3 k Ω
2 2	Throttle-valve potentiometer (short to ground/ open circuit)	Accelerator pedal at idle: Accelerator pedal in full-throttle position: Constant change in resistance between min. and max.	7 6 7 6 7 6	min. < 270 Ω max. 1,4...2,4 k Ω max. 1,4...2,4 k Ω
3 6 *)	RON - encoding (short to ground)	Resistance of octane-number plug Fault code is set if RON encoding changes from status on starting.	25 16	91 RON infinity Ω 95 RON 0 Ω

*) Fault code is contained on Vectra 1.8 S with engine E 18 NVR.

SELF-DIAGNOSIS TEST TABLE

Fault display Flashing code	Testing of component/function	Test instructions/test conditions		Terms.		Set values
4 1	Intake-manifold temperature sensor (short to ground)	Resistance of temperature sensor:	at 20 °C at 80 °C	13 13	23 23	2...3 k Ω 280...360 Ω
4 2 *)	Primary current too high	Ignition coil, resistance, primary side secondary side		1 ———	19	approx. 0,7 Ω 6,9...11 k Ω
4 3	Intake-manifold temperature sensor (open circuit)	Resistance of temperature sensor:	at 20 °C at 80 °C	13 13	23 23	2...3 k Ω 280...360 Ω
4 8	Supply voltage too low		at 80 °C	4 +	5 –	> 10 V
4 9	Supply voltage too high	Check alternator/regulator	at 80 °C	4 +	5 –	< 15 V
5 1 / 5 5 *)	Control unit defective	Once all faults have been read out: Clear fault memory. Run engine briefly. Repeat self-diagnosis output. Renew control unit if fault is indicated again.		—		———
5 3	Potentiometer in throttle-valve positioner (open circuit)	Resistance, potentiometer, throttle valve and throttle-valve positioner (parallel):		9	6	0,7...1,3 k Ω
5 4	Potentiometer in throttle-valve positioner (short to ground)	Wiper resistance, potentiometer in throttle-valve positioner: (actuate evacuation valve in throttle-valve positioner during test and pull back throttle-valve positioner with vacuum hand pump). Constant decrease in resistance.		28 28	6 6	min. < 400 Ω max. 1,4...2,6 k Ω

*) Fault code is contained on Vectra 1.8 S with engine E 18 NVR.

SELF-DIAGNOSIS TEST TABLE (continued)

Fault display Flashing code	Testing of component/function	Test instructions/test conditions	Terms.	Set values
5 6	Choke-valve actuator current too high	Insulation resistance of choke-valve actuator:	14 5	> 1 M Ω
5 7	Choke-valve actuator current too low	Winding resistance of choke-valve actuator:	14 15	0,9...1,7 Ω
5 8	Input for CO adjustment (short to ground)	Insulation resistance, input, CO adjustment:	10 5	> 1 M Ω
5 9	Throttle-valve positioner extends too slowly	Fault is only indicated if engine is idling on diagnosis output.		
6 1	Throttle-valve positioner retracts too slowly	Switch off engine and check retraction/extension time of throttle-valve positioner: Retraction time:	——	max. 1 s
		Extension time:	——	max. 1 s
6 2 *)	Throttle-valve positioner vent valve intervention time too long			
6 3 *)	Throttle-valve positioner evacuation valve intervention time too long			
6 4 *)	Primary current too low	Ignition coil, resistance, primary side	1 19	approx. 0,7 Ω
		secondary side	——	6,9...11 k Ω
7 5 *)	Transmission identifier (short to ground)	Check lead for short to ground. Transmission control unit (if fitted) defective. Continue testing with electronic transmission control.	——	——
7 6 *)	Transmission identifier ignition intervention time too long			

*) Fault code contained on Vectra 1.8 S with engine E 18 NVR.

TEST SPECIFICATIONS:

Idle speed:	780...880 min-1
with idle-speed increase	880...980 min-1
CO adjustment:	
CO value with engine at normal operating temperature	0,2...0,3 % CO by vol.
With CO adjustment plug plugged in	0,5...1,5 % CO by vol.
Fuel pressure:	0,1...0,3 bar
Minimum fuel delivery (at 2000 min-1)	1 l/min
Float weight:	8,0...8,6 g
Float height:	26,5...28,5 mm

(Float level cannot be adjusted

Throttle-valve potentiometer

Total resistance:	1,4...2,6 k Ω
Wiper resistance in correcting range: min.	less than 270 Ω
max.	1,4...2,4 k Ω

Choke-valve actuator:
Winding resistance: 0,9...1,7 Ω

Basic setting, throttle valve Stage II: a = 0,03...0,07 mm

Release and forced return Stage II: Y = 0,1...0,7 mm
Z = 0,3...0,5 mm

Tightening torques
Flange mounting 9 Nm

TEST SPECIFICATIONS (continued):

Throttle-valve actuator

evacuating valve (term.1/term.2):	20...70 Ω
ventilating valve (term.6/term.7):	20...70 Ω
Total resistance, potentiometer (term.3/term.4):	1,4...2,6 k Ω

Wiper resistance in correcting range (term.5/term.3):
min. less than 400 Ω
max. 1,4...2,4 k Ω

Inductive engine-speed and reference-mark sensor:
Internal resistance 0,5...0,8 k Ω

Temperature sensor (NTC):

Internal resistance at 20°C:	2...3 k Ω
at 80°C:	280...360 Ω

Heating element, intake-manifold heating:
Internal resistance at 20°C: 0,6...0,7 Ω

Heating element, bypass heating:
Internal resistance at 20°C: 1,4...2,1 Ω

Type of nozzle:

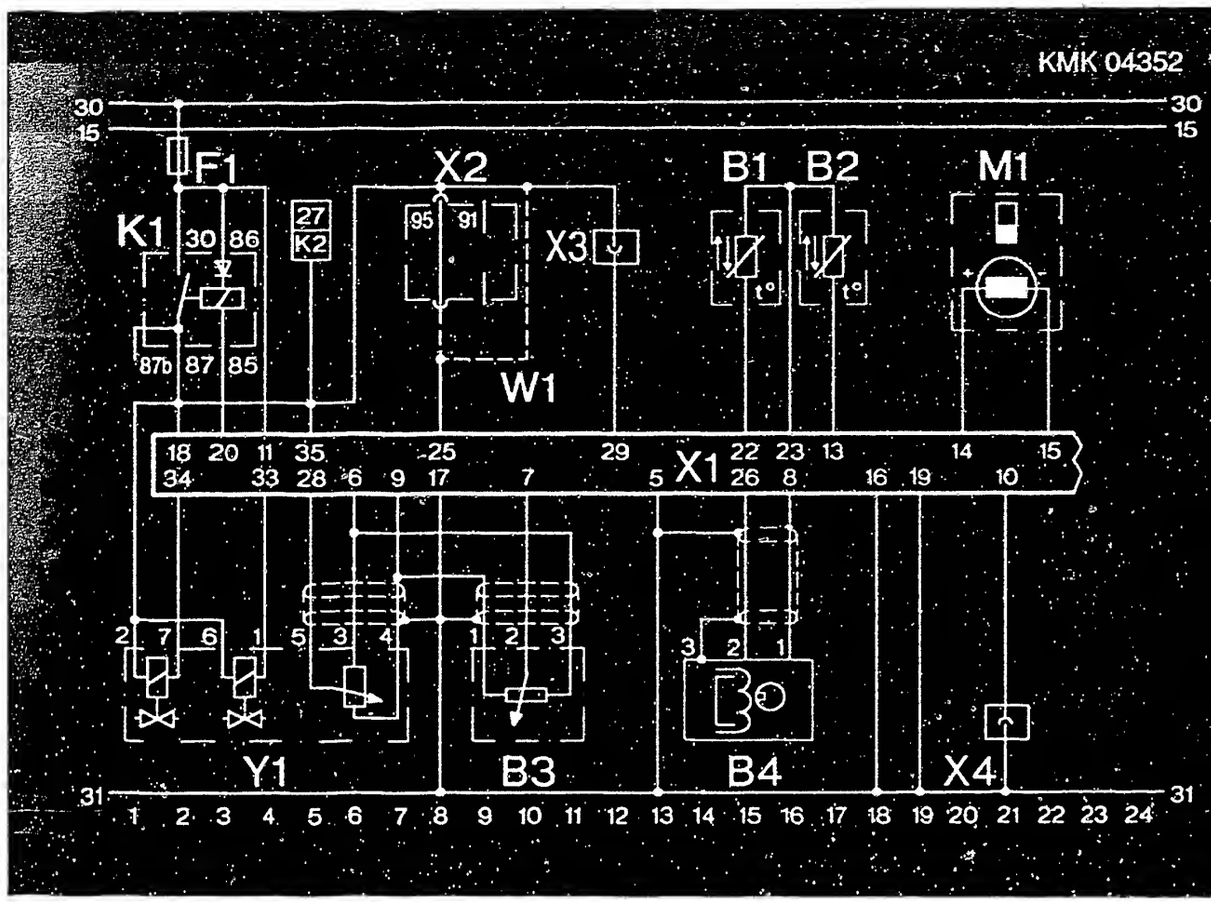
	Stage 1	Stage 2
Main nozzle	x 110	x 135
Idle fuel nozzle	x 52,5	
Air-correction nozzle	x 110	x 70

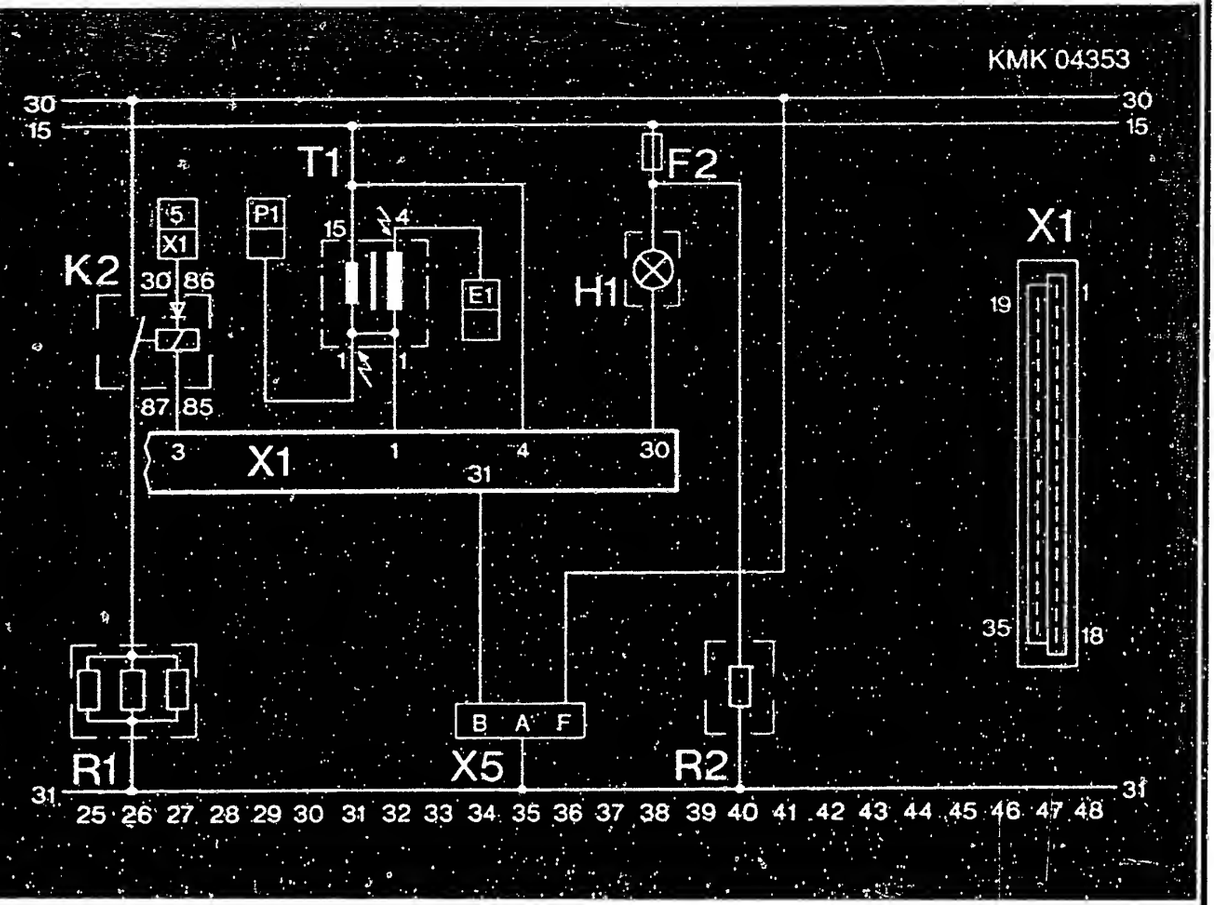
Coding plug, octane-rating adaptation:

Resistance at:
91 RON: infinity Ohms
95 RON: 0 Ω

Voltage supply for potentiometer (throttle valve and throttle-valve actuator) and temperature sensor:
4,5...5,5 V

See equipment and Autodata microcards for the setting values for valve clearance and other engine-related data.

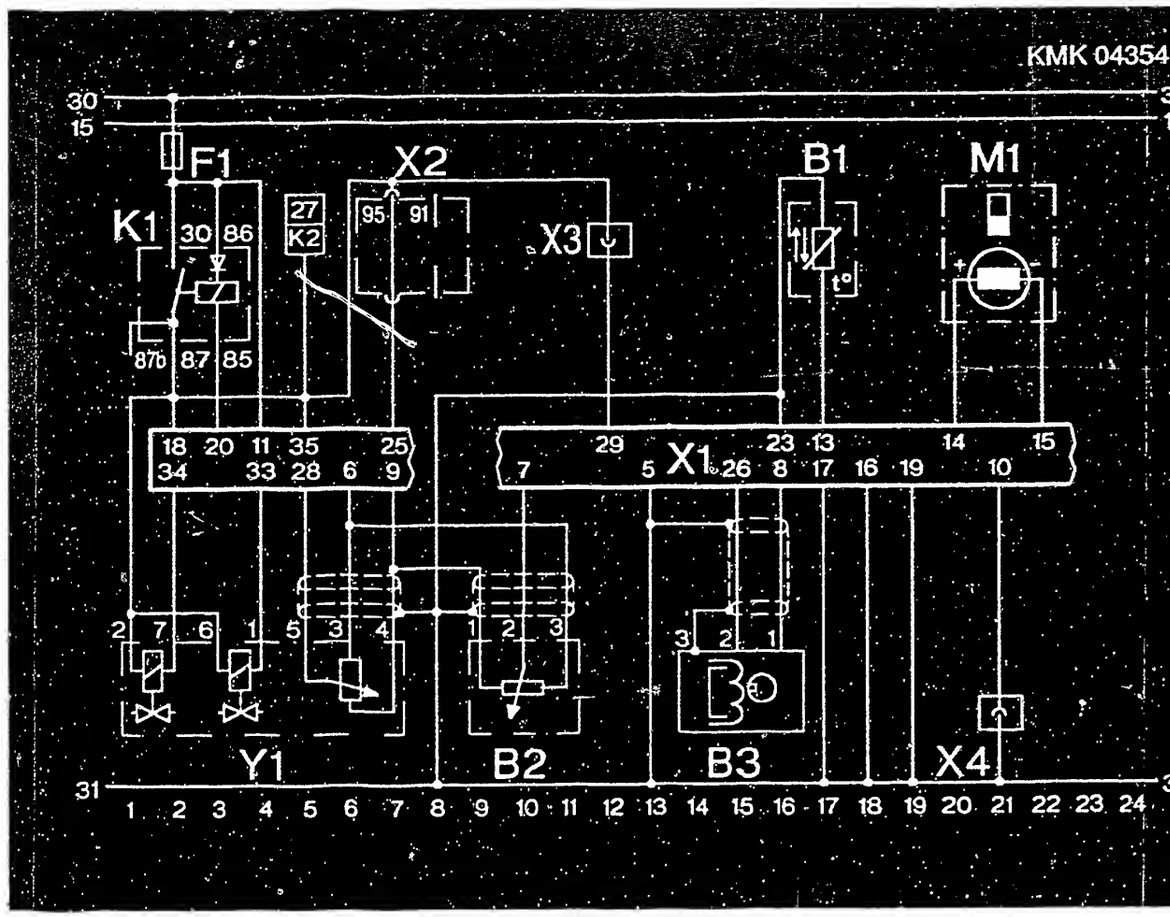


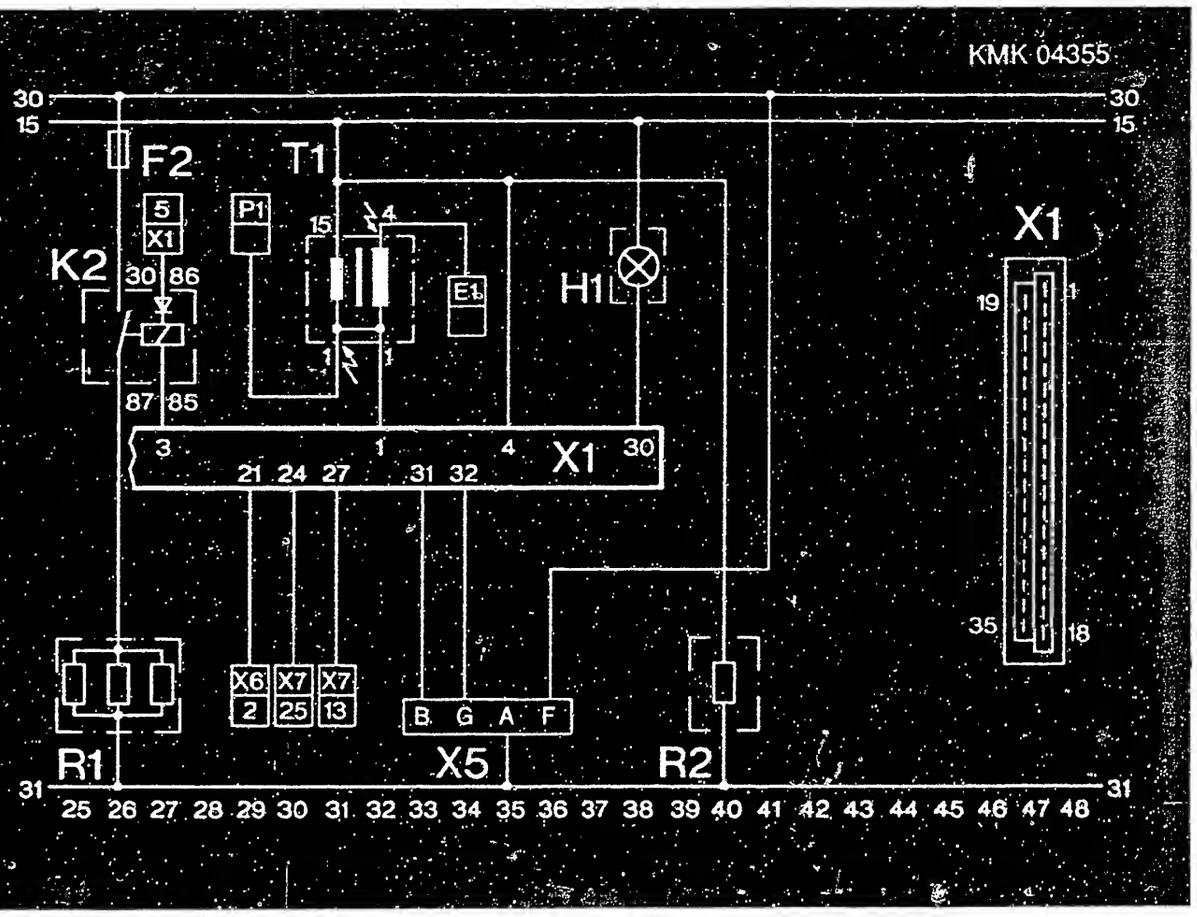


ELECTRICAL TERMINAL DIAGRAM

Engine E 18 NV / S 18 NV:

B1 = Intake-manifold temperature sensor
B2 = Coolant temperature sensor
B3 = Throttle-valve potentiometer
B4 = Engine-speed/reference-mark sensor
F1 = Fuse, control unit
F2 = Fuse, carburetor preheating
H1 = Diagnosis lamp
M1 = Choke-valve actuator
K1 = Main relay
K2 = Relay, intake-manifold heating
R1 = Intake-manifold heating
R2 = Carburetor preheating
W1 = Connection only on engine E 18 NV
X1 = Control-unit plug
X2 = Octane-number plug engine E 18 NV only
X3 = Connector, idle-speed increase
X4 = Connector, CO setting
X5 = Diagnosis plug
Y1 = Throttle-valve positioner

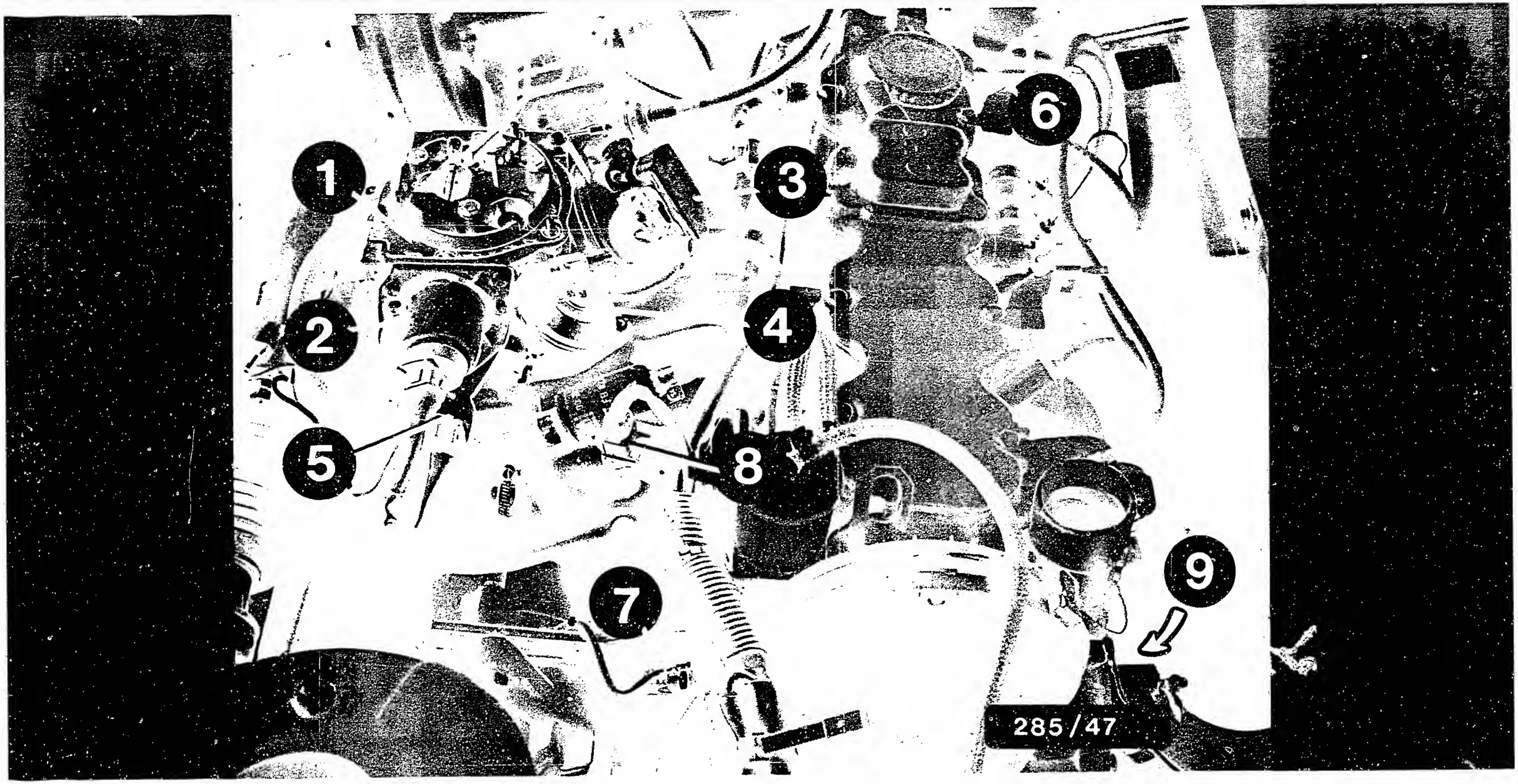




ELECTRICAL TERMINAL DIAGRAM

Engine E 18 NVR:

B1 = Coolant temperature sensor
B2 = Throttle-valve potentiometer
B3 = Engine-speed/reference-mark sensor
F1 = Fuse, control unit
F2 = Fuse, intake-manifold heating
H1 = Diagnosis lamp
M1 = Choke-valve actuator
K1 = Main relay
K2 = Relay, intake-manifold heating
R1 = Intake-manifold heating
R2 = Carburetor preheating
X1 = Control-unit plug
X2 = Octane-number plug
X3 = Connector, idle-speed increase
X4 = Connector, CO adjustment
X5 = Diagnosis plug
X6 = Control-unit plug, 4 WD
(only Vectra 1.8 S 4x4)
X7 = Control-unit plug, transmission control
(if fitted)
Y1 = Throttle-valve positioner

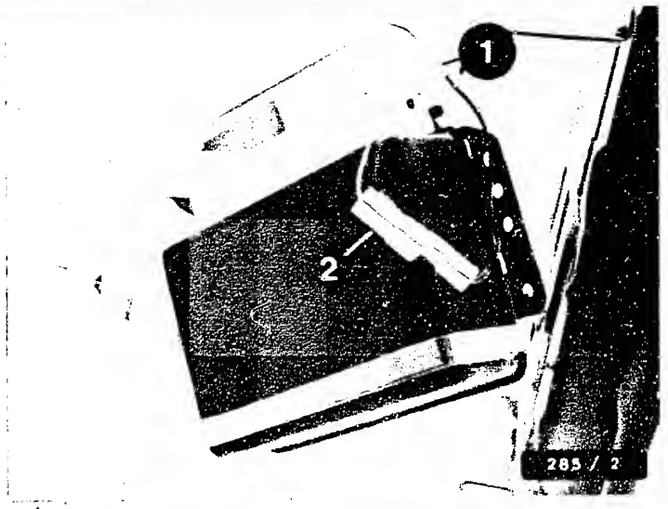


INSTALLATION POSITION OF COMPONENTS

1 = Carburetor
2 = Choke-valve actuator
3 = Throttle-valve actuator
4 = Vacuum unit stage 2
5 = Throttle-valve potentiometer
6 = High-voltage distributor
7 = Coolant-temperature sensor
8 = Intake-manifold temp. sensor
9 = Reference-mark sensor

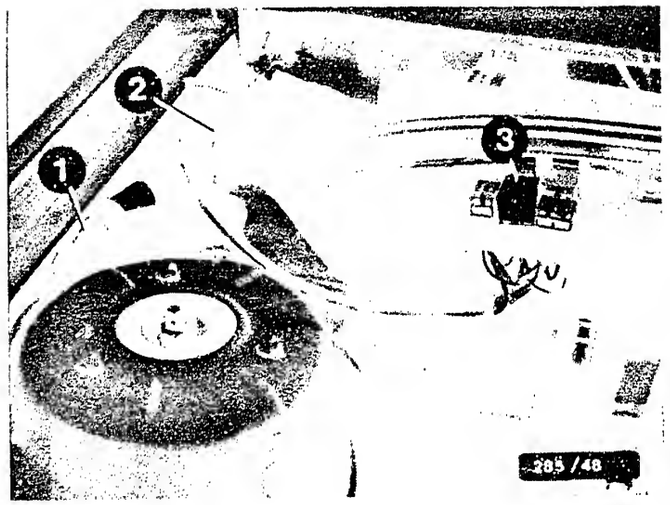
INSTALLATION POSITION OF COMPONENTS (Continued)

The Ecotronic control unit with integral ignition is installed in the right-hand footwell beneath the cover (upper illustration). The cover has already been removed in the illustration.
For the purpose of octane-rating adaptation, a coding loop has been installed in the wiring harness in vehicles with the S 18 NV engine (upper illustration, 1), and a coding plug has been installed in the engine compartment on the right-hand side behind the spring-strut dome in vehicles with the E 18 NV engine.
The engine speed can be increased by approx. 100 min $^{-1}$ via this plug connection (upper illustration, arrow 2).

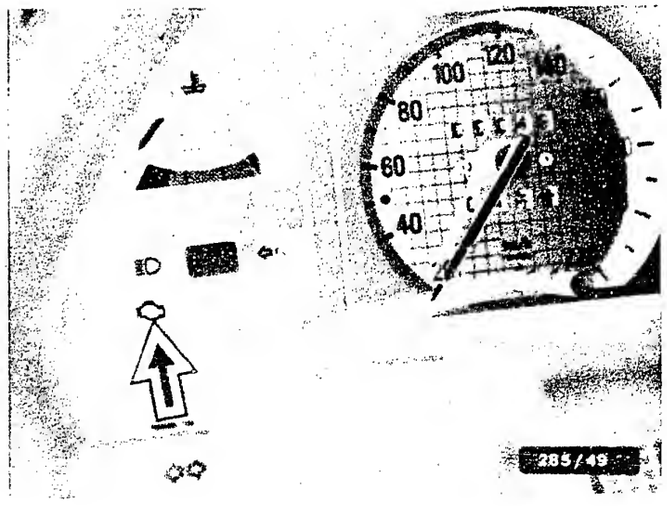


The diagnostic plug is located in the engine compartment on the right-hand side behind the spring strut (center illustration, 1).
Plug for CO adjustment (center illustration, 2).
If a CO analyzer with which small CO values can be measured is not available, create a plug connection for CO adjustment. CO value is increased.

Control relay and intake-manifold heating relay are installed on the firewall (center illustration, 3).



The warning and diagnostic lamp is installed in the instrument panel (lower illustration, arrow).



T A B L E O F C O N T E N T S

Trouble-shooting instructions : AUD-5003

BOSCH system : Ecotronic (4.0 A)

Make of vehicle : AUDI

Basic microcard : KFZ-00..

SPECIAL FEATURES

* This microcard contains the ECO 4.0A trouble-shooting instructions, valid at the time of publication, for the following AUDI-model:
  AUDI 80 (04.87 ->)
  (with 1,6 l engine)
  Engine code letter: PP

* Ecotronic (ECO 25) with 3 -pin control unit.

* The control unit is equipped with self-diagnosis. Should a fault occur in the system, this fault is stored in the fault memory and may be read out by the diagnostic lamp in the instrument panel.
  If a sensor fails, the control unit operates using specified substitute values.

* The ventilating valve in the throttle-valve actuator is supplied with filtered air via an additional filter (built on to the air filter).

* The system is similar to the Ecotronic (ECO MB-530), Mercedes-Benz
  See SIS .

SPECIAL FEATURES (continued):

The control range of the lambda closed-loop control system can be indicated by means of an evaluation unit KDAW 9980 or by means of a commercially available LED test lamp.

Testing and adjusting lambda closed-loop control range:

The correct setting of the lambda closed-loop control range is indicated by way of flashing pulses from the LED.
Initiation of indication:
- Switch off ignition for at least 20 s.
- Connect evaluation unit for flashing code KDAW 9980 socket 2 and socket 4 to test coupling for diagnosis.
  Connect evaluation unit socket 1 to $+U_B$ and socket 3 to ground.
  Keep button on evaluation unit pressed and start engine.
- Release button on evaluation unit after engine has been running for at least 4 s.
- Bring lambda sensor up to operating temperature; to do so, increase engine speed for 1 min. to between in excess of 2000 and max. 3500 min^{-1}.
  Note: If the engine speed is increased to in excess of 4000 min^{-1}, the indication is reset; initiate indication again.

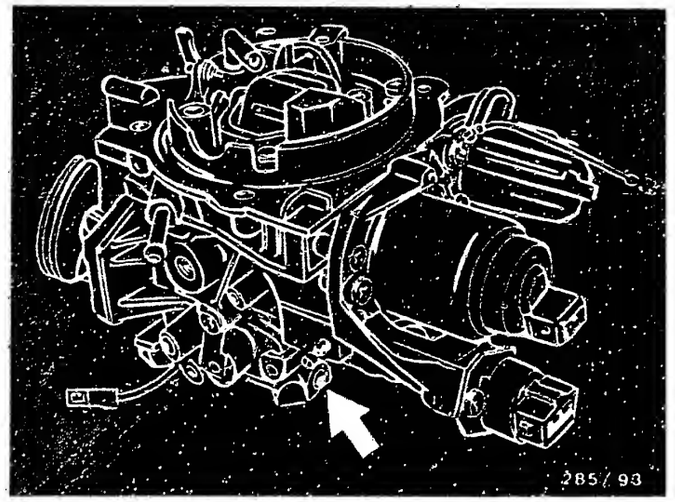
Lambda closed-loop control within control range:
LED flashes 1,5 times per second.

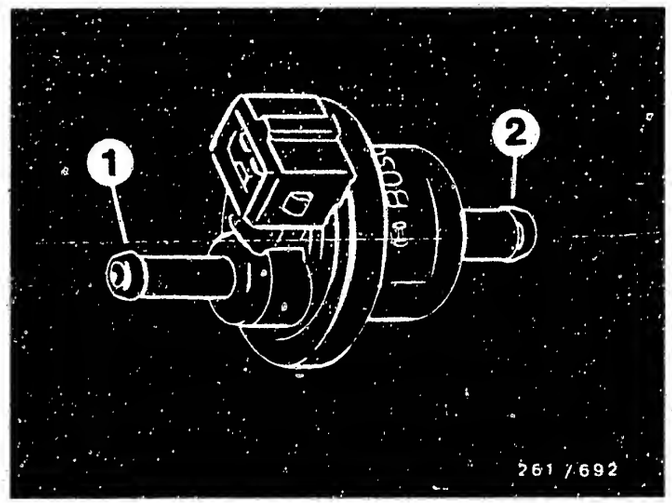
Lambda closed-loop control on rich stop:
LED lights up all the time.

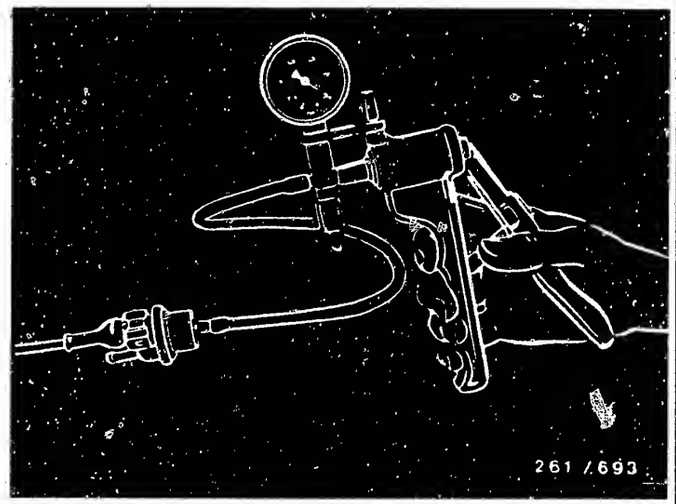
Lambda closed-loop control on lean stop:
LED does not light up.

Adjust closed-loop control range by way of idle-mixture-adjusting screw (top picture, arrow).
Note: LED flickers (25 times per second)
- Lambda sensor not at operating temperature
- Open-circuit in lead to lambda sensor.

Testing ACF bleeder valve for leaks:
Remove ACF bleeder valve.
Connect vacuum pump (e.g. Mityvac) to intake-manifold connection of valve (center picture, 2).
1. Valve deenergized -> continuity (vacuum build-up not possible).
2. Actuate valve with battery voltage (10...15 V) (use connecting lead KDJE 7450/70) (bottom picture).
Generate vacuum of approx. 0,5 bar.
Permissible drop in pressure: 0,25 bar in approx. 10 s.







SPECIAL FEATURES (Continued)

Check tank ventilation:

Pull vacuum hose off at tank ventilation valve (connection to active-carbon container) and connect up vacuum gauge.
Engine idling at operating temperature (approx. + 80 Grad C).
Lambda control in operation. Observe vacuum reading.

Set value:
Change between 400...600 mbar and 700...1000 mbar
Increase engine speed to approx. 3000 1/min.

Set value:
500...1000 mbar

If set value is not attained, check vacuum hose to carburetor for leaks/check tank ventilation valve.

Visually inspect active-carbon container. Check for leaks in vacuum lines between active-carbon container and tank ventilation valve, float-chamber vent valve and tank.

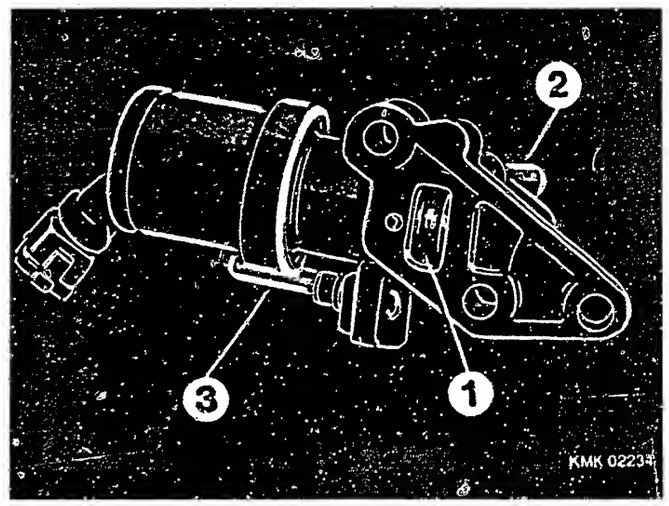
Check electr. float-chamber vent valve (top picture):
Switch off ignition and check voltage supply.

Set value: approx. battery voltage

Unscrew vent valve and apply + 12 V.

Set value:
Valve plate (top picture, item 1) is pulled onto its seat and interrupts connection between float chamber and vacuum connections (top picture, items 2 and 3).

Renew vent valve if set value is not attained.



STRUCTURE, USAGE

These brief instructions encompass essentially vehicle-specific special features and test specifications (set values).

In accordance with the customer complaint, the trouble-shooting chart leads to various causes/component faults.
Detailed instructions for trouble-shooting must be taken from the basic instructions via the trouble-shooting chart.

ATTENTION: Even if reference is made to basic instructions, the set values, terminal assignments and special features of these vehicle-related brief instructions are always binding.

Finding individual test steps in the brief and basic instructions is possible via the tested function or components. Tests which deviate from the basic instructions are described under Special Features.

SAFETY AND PRECAUTIONARY MEASURES

In order to keep persons out of danger and to prevent damage to the engine, control unit or ignition system, be sure to observe the safety and precautionary measures in the basic instructions.

* C A U T I O N !
  High-performance ignition system.
  Dangerous primary and secondary voltages.

  Touching voltage-carrying components or terminals may prove fatal (both on the primary and secondary sides).

See Basic Instructions for further precautionary measures.

TROUBLE-SHOOTING CHART

Customer complaint (symptoms of trouble)
1. Starting motor operates, but engine fails to start or starts only with difficulty.
2. Engine starts but then dies.
3. Rough idling (engine speed, exhaust gas).
4. Poor throttle response, flat spot during acceleration.
5. Misfiring (ignition, fuel induction).
6. Maximum engine power/top speed not reached.
7. Fuel consumption too high.
8. Engine diesels.
9. Engine pings/knocks.
10. Engine becomes too hot.
11. Fault lamp.

1	2	3	4	5	6	7	8	9	10	11	Cause (component fault)
*	*	*	*	*	*	*	*	*	*	*	Evaluate self-diagnosis
										*	Fault lamp defective
								*	*		Poor fuel quality
*			*	*	*						Test fuel pressure
	*			*	*						Test fuel quantity
*	*	*	*	*	*	*					Choke-valve plate stiff
*	*			*	*						Test float-needle valve
*	*	*	*	*	*						Dirt in carburetor
	*	*	*	*	*						Induction system leaking
	*	*									Intake-manifold heating defective
	*	*									Intake-air pre-heating defective
					*						Exhaust system defective

TROUBLE-SHOOTING CHART (continued)

Customer complaint (symptoms of trouble)										
1. Starting motor operates, but engine fails to start or starts only with difficulty.										
2. Engine starts but then dies.										
3. Rough idling (Engine speed, exhaust gas).										
4. Poor throttle response, flat spot during acceleration.										
5. Misfiring (ignition, fuel induction).										
6. Maximum engine power/top speed reached.										
7. Fuel consumption too high.										
8. Engine diesels.										
9. Engine pings/knocks.										
10. Engine becomes too hot.										
11. Fault lamp.										
										Cause (component fault)
		*				*				Test adjustment, throttle valve stage I
		*	*	*	*	*				Incorrect type of nozzle
			*		*					Vacuum unit, stage II
		*	*		*					Test adjustment, throttle-valve stage II
			*		*	*				Test adjustment, accelerator actuation
		*	*							Throttle valve worn out
									*	Test TD signal
					*	*				Test enrichment tube
		*	*							Test bypass heating
*					*	*				Float-chamber change-over valve defective
		*	*							Test activated carbon filter (Visual exam.)
		*								Venting filter, throttle-valve actuator

TROUBLE-SHOOTING:
USING THE SELF-DIAGNOSIS:

A control unit is installed in this vehicle, which possesses a self-diagnosis facility. Therefore, always begin trouble-shooting with self-diagnosis.
Self-diagnosis is divided into two parts:

1. Reading out the fault memory (self-diagnosis)

2. Final-controlling-element diagnosis.

After stimulation of the self-diagnosis at the intake-manifold-heating relay, all the electronic control units intalled in the vehicle, which are equipped with self-diagnosis, are induced to output their diagnosis.
In the self-diagnosis test table starting on coordinates (13) , the indicated faults
of the Ecotronic are broken down.
The self-diagnosis test table contains fault indication, components tested, test clips at control-unit plugs, cause of trouble, test instructions and set values.

Only if there is no fault stored in the fault memory, but there is a customer complaint, must trouble-shooting be performed in accordance with the trouble-shooting charts starting at coordinate (06) .
Only the components which cannot be tested via the self-diagnosis facility are listed in the trouble-shooting charts.

HOW TO USE SELF-DIAGNOSIS AND SELF-DIAGNOSIS TEST TABLE

Connecting evaluation unit for flashing code KDAW 9980:
Connect evaluation unit for flashing code KDAW 9980 socket 2 and socket 4 to test coupling for diagnosis.
-> 08.88 to relay, intake-manifold heating (top picture, arrow).
08.88 -> to black diagnosis connection (center picture, item B).
Connect evaluation unit socket 1 to $+U_B$ and socket 3 to ground.

Activating self-diagnosis:
Allow engine to idle (if applicable, perform test drive beforehand)
or crank starting motor for approx. 6 seconds (do not switch off ignition).
Press button on evaluation unit for more than 4 s.
Output of the self-diagnosis commences with a start signal (bottom picture, a) (fault lamp lights up for approx. 2,5 seconds).

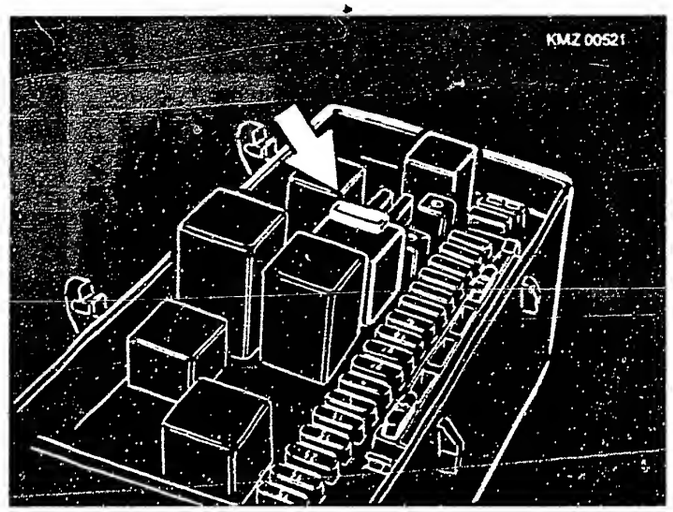
Activating actuator diagnosis:

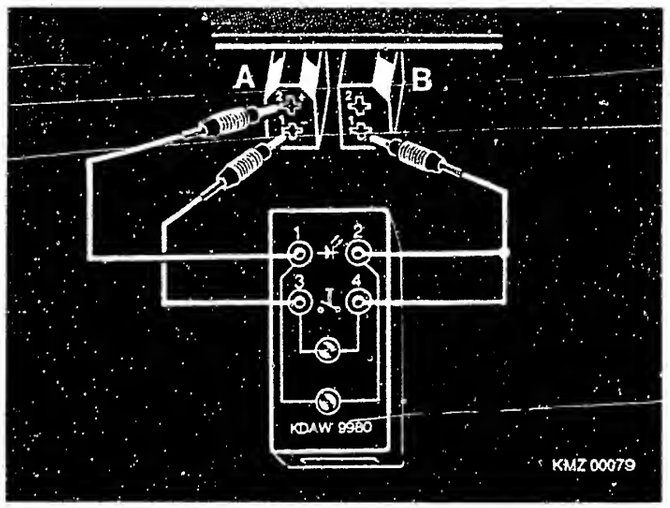
On vehicles with Bosch ignition trigger box additionally connect term. 7 of ignition trigger box to + 12 V.
Switch off ignition (min. 20 sek.).
Keep button on diagnosis evaluation unit pressed, switch on ignition.
Release button after more than 4 seconds.
With output of actuator diagnosis
(flashing code 4432, 4323, 4324, 4342 and 4343)
the corresponding actuators are simultaneously activated during flashing-code output and can be checked by listening to or feeling them (flashing code only indicates actuated component).

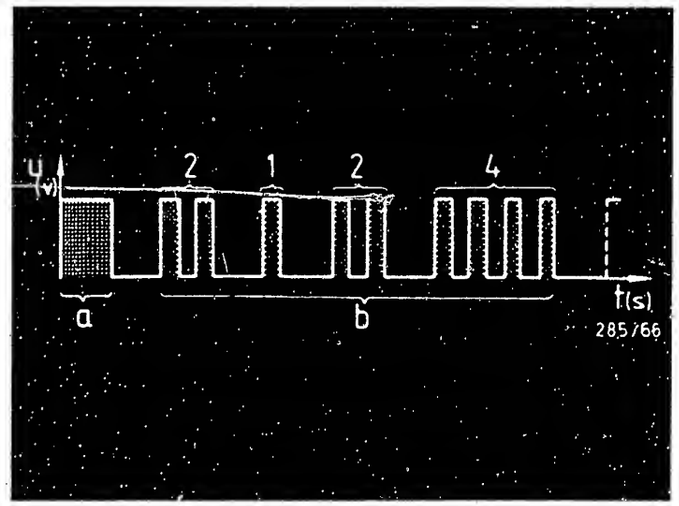
Note: Check TD signal if actuator diagnosis not possible.

Continuation of diagnosis:

Once a fault has been read out, the next fault is output or the next actuator activated by pressing the button again (more than 4 s).



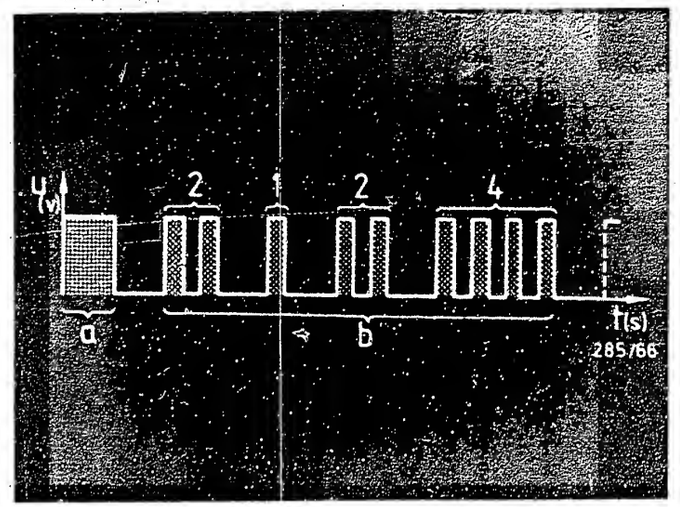




HOW TO USE SELF-DIAGNOSIS AND SELF-DIAGNOSIS TEST TABLE

N o t e :

The fault memory is cleared 15 seconds after switching off the ignition.
Should it not be possible to stimulate the control unit to provide diagnosis output, the voltage supply of the control unit and the diagnosis line from the control unit term. 6 to the diagnosis test coupling are to be checked for open circuit.
If there is no engine-speed signal, the LED lights brightly without button pressed on evaluation unit and the fault memory cannot be read out.



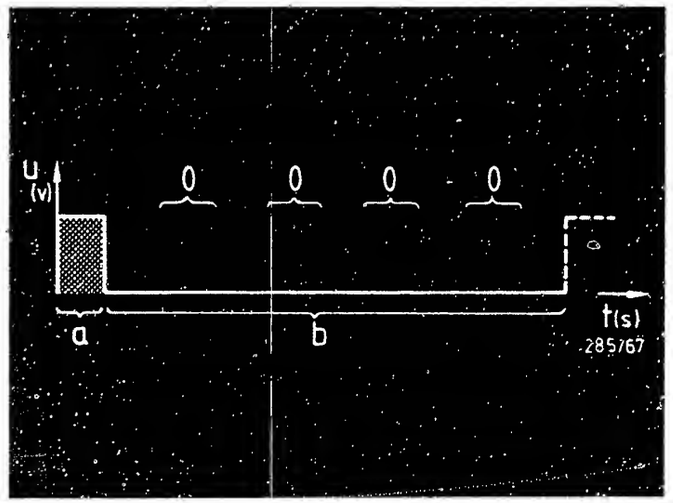
Flashing-code evaluation (top picture, b):

The flashing code for each fault consists of four flashing-pulse blocks.
Each block represents a number and features between 1 and 4 pulses.
One pulse corresponds to the number 1, whereas four pulses correspond to the number 4.
The fault lamp lights briefly with each pulse.

The interval between the blocks is longer than between the individual pulses.
Between two fault codes, continuation is effected by pressing the button again for more than 4 seconds.
The flashing code 4444 is output if there is no fault stored in the control unit.

If there is a fault stored in the control unit, the first fault (top picture, b) is output following the start signal.
If there is a further fault stored, its flashing code follows on effecting continuation by way of renewed short to ground.

Continuation must be effected until the flashing code 0000 (see bottom picture) indicates the end of self-diagnosis.
The fault memory is cleared when the ignition is switched off and the main relay is deenergized approx. 15 seconds later.



SELF-DIAGNOSIS TEST TABLE

Fault display Flashing code	Testing of component/function	Test instructions/test conditions	Terms.		Set values
4444	Control unit	Control unit indicates that there is no fault in fault memory.	30		—
1232	Throttle-valve positioner vent/evacuation valve (short to ground or open circuit)	Perform actuator diagnosis. (Only indicated as of control unit 0 285 007 042, .. 43)	—		—
2124	Potentiometer in throttle-valve positioner. (Short to ground or open circuit).	Resistance, potentiometer, throttle valve and throttle-valve positioner (parallel):	18	7	0,7...1,3 k Ω
		Wiper resistance, potentiometer in throttle-valve positioner:			
		(actuate evacuation valve in throttle-valve positioner during test and pull back throttle-valve positioner with vacuum hand pump). Continuous decrease in resistance.	17 17	7 7	min. < 400 Ω max. 1,4...2,6 k Ω
2212	Throttle-valve potentiometer (short to ground/ open circuit)	Resistance, potentiometer, throttle valve and throttle-valve positioner (parallel):	18	7	0,7...1,3 k Ω
		Wiper resistance, throttle-valve potentiometer: Run engine at idle. Seal off vent side of throttle-valve positioner. Switch off engine. Switch on ignition.			
		Accelerator in idle position:	11	7	min. < 270 Ω
		Accelerator in full-throttle position:	11	7	max. 1,4...2,4 k Ω
		Resistance constantly changes between min. and max.	11	7	max. 1,4...2,4 k Ω
2214	Maximum speed exceeded	Max. speed 7000 1/min. exceeded whilst driving.	25	20	6950 1/min
		(Check speed limitation on dynamometer)	12	12	-0,6...2,8 A

SELF-DIAGNOSIS TEST TABLE (continued)

Fault display Flashing code	Testing of component/function	Test instructions/test conditions	Terms.	Set values
2312	Coolant temperature sensor (short to ground/ open circuit)	Resistance of temperature sensor: at 20 °C at 80 °C	21 7 21 7	2...3 k Ω 280...360 Ω
2341	Lambda control at control limit	Check Lambda control and readjust control range: Initiate display of Lambda control range.	6	LED on evaluation unit flashes at 1,5 Hz
2342	Lambda sensor at control limit	Check lead from control unit term. 8 to connector of Lambda sensor for short to ground or battery positive: (Connector of Lambda sensor pulled off)	8 (−) 8 (+) 8	> 1 M Ω > 1 M Ω approx. 0 Ω
2412	Intake-air temperature sensor (short to ground/ open circuit).	Resistance of temperature sensor: at 20 °C at 80 °C	5 7 5 7	2...3 k Ω 280...360 Ω
4432	Choke-valve actuator Short to ground	Insulation resistance of choke-valve actuator: Winding resistance of choke-valve actuator:	10 12 10 12	< 1 M Ω 0,9...1,7 Ω
2122	No TD-signal	Check TD-signal whilst starting: Fault is only indicated if TD-signal was present when engine was last started. (Only indicated as of control unit 0 285 007 042 ..043)	25 20	Rectangular pulses between 0 and 12 V
0000	End of diagnosis output	Control unit indicates that diagnosis output is over. Fault lamp flashes at 2,5 sec.-intervals (start signal).	—	———

SELF-DIAGNOSIS TEST TABLE (continued)
Final-controlling-element diagnosis (component is activated by control unit during flashing-code output).

Flash code	Testing of components/function	Test instructions/Test conditions	Terminals		Set values
4432	Choke-valve actuator	Choke-valve actuator is activated during diagnosis output. Insulation resistance of choke-valve actuator: Winding resistance of choke-valve actuator:	 10 10	 12 12	 greater than 1M Ω less than 10 Ω
4343	Activated-carbon-filter bleeder valve	Final-controlling-element diagnosis: bleeder valve is actuated during flashing-code output. Insulation resistance Winding resistance	 15 15	 2 23	 greater than 1 M Ω less than 50 Ω
4342	Relay for intake pre-heating	Final-controlling-element diagnosis: relay is actuated during flashing-code output. Insulation resistance Winding resistance	 14 14	 2 23	 greater than 1 M Ω less than 50 Ω
4323	Ventilating valve in throttle-valve actuator	Final-controlling-element diagnosis: ventilating valve is actuated during flashing-code output. Insulation resistance, ventilating valve: Winding resistance, ventilating valve:	 9 9	 2 23	 greater than 1M Ω 20...80 Ω
4324	Evacuating valve in throttle-valve actuator	Final-controlling-element diagnosis: evacuating valve is actuated during flashing-code output. Insulation resistance, evacuating valve: Winding resistance, evacuating valve:	 3 3	 2 23	 greater than 1M Ω 20...80 Ω
0000	Diagnosis output complete	Control unit indicates that the diagnosis output is complete. Fault lamp flashes at 2,5 s. interval (start signal).	—		———

TEST SPECIFICATIONS:

Idle speed: 900 ± 75 min $^{-1}$
Note: the idle speed is controlled and cannot be adjusted.

Engine-speed limitation 7000 ± 50 min $^{-1}$

Exhaust-gas adjustment:
Test CO value at sampling pipe before catalytic converter: %CO by vol.0,2...1,0
To do this, hose for engine ventilation and lead to lambda sensor are disconnected.

Fuel pressure: 0,1...0,3 bar
Minimum fuel delivery (at 2000 min $^{-1}$) 1 l/min

Float weight: (dry) 7,7 ± 0,3 g
Float height: 27,5 ± 1,0 mm
(Float level cannot be adjusted)

Throttle-valve potentiometer
Total resistance: 1,4...2,6 k Ω
Wiper resistance in correcting range: min. less than 270 Ω
max. 1,4...2,4 k Ω

Choke-valve actuator.
Winding resistance: 0,9...1,7 Ω

Basic setting, throttle valve
Stage I (with feeler gauge) 3,15 mm
Stage II a = 0,03 ± 0,02 mm

Release and forced return
Stage II: Y = 1,0 ± 0,3 mm
Z = 0,4 ± 0,2 mm

Float-chamber change-over valve
Winding resistance less than 50 Ω

Activated-carbon-filter bleeder valve
Winding resistance: 30...60 Ω

TEST SPECIFICATIONS (continued):

Throttle-valve actuator
Evacuating valve (term. 1 /term. 2): 20...70 Ω
Ventilating valve (term. 6/term. 7): 20...70 Ω
Total resistance, potentiometer (term. 3/term. 4): 1,4...2,6 k Ω
Wiper resistance in correcting range (term. 5/term.3): min. less than 400 Ω
max. 1,4...2,4 k Ω

Temperature sensor (NTC):
Internal resistance at 20°C: 2,0...3,0 k Ω
at 80°C: 280...360 Ω

Heating element, intake-manifold heating:
Internal resistance at 20°C: approx.
0,25...0,5 Ω

Heating element, part-load channel:
Internal resistance at 20°C: approx.
1,5...2,5 Ω

Type of nozzle:

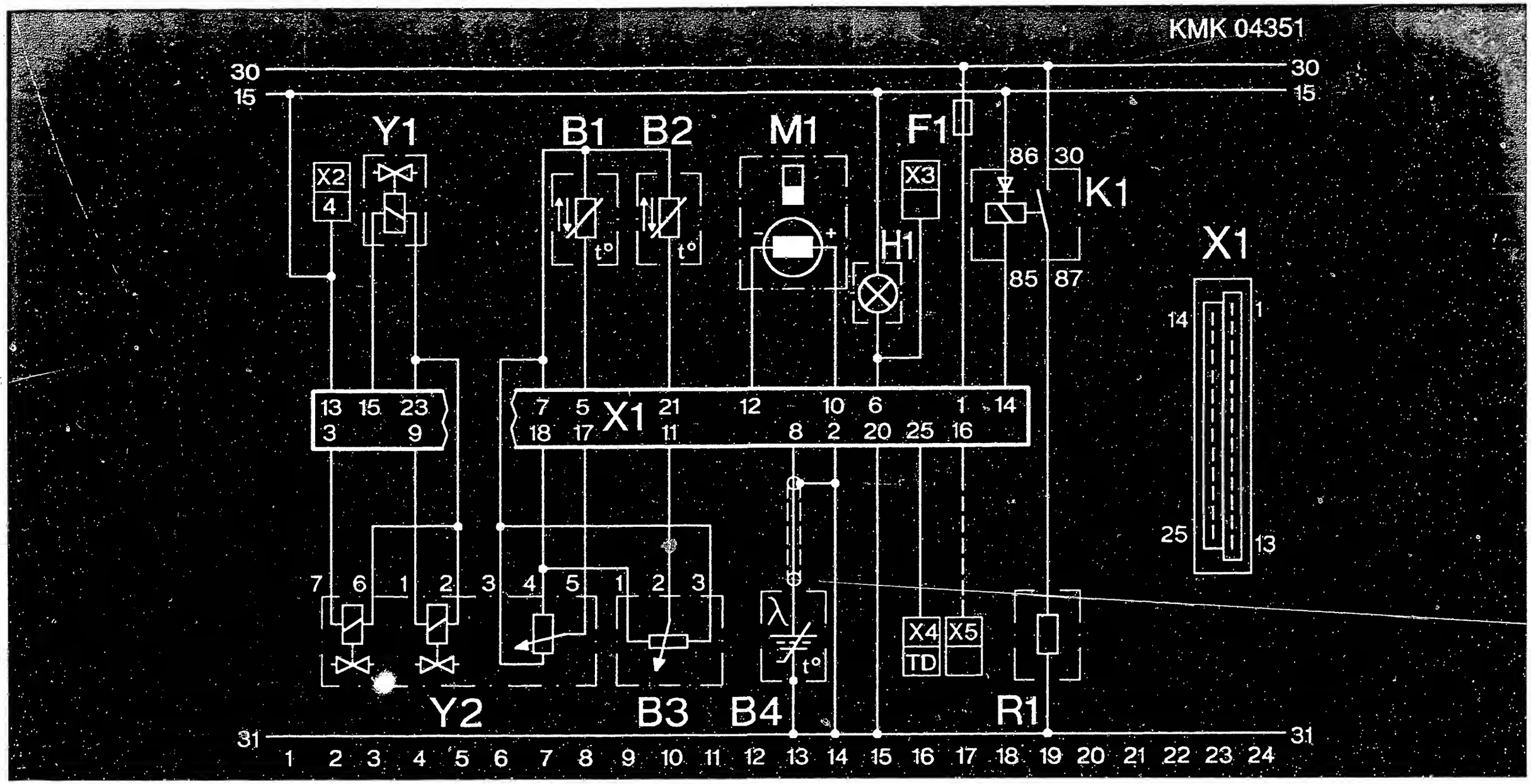
	Stage 1	Stage 2
Main nozzle	x 105	x 110
Idle fuel nozzle	x 45	
Acceleration fuel nozzle		90
Air correction nozzle (with mixing tube)	x 110	x 105
Acceleration air nozzle		x 130
Full-load enrichment		100 ± 10

Tube for full-load enrichment
Height above pre-atomizer 13,5 ± 1,0 mm

Tightening torques
Securing of carburetor upper section 5 Nm
Flange mounting 13 Nm

See equipment and Autodata microcards for setting values for valve clearance and other motor-related data.

KMK 04351



ELECTRICAL TERMINAL DIAGRAM

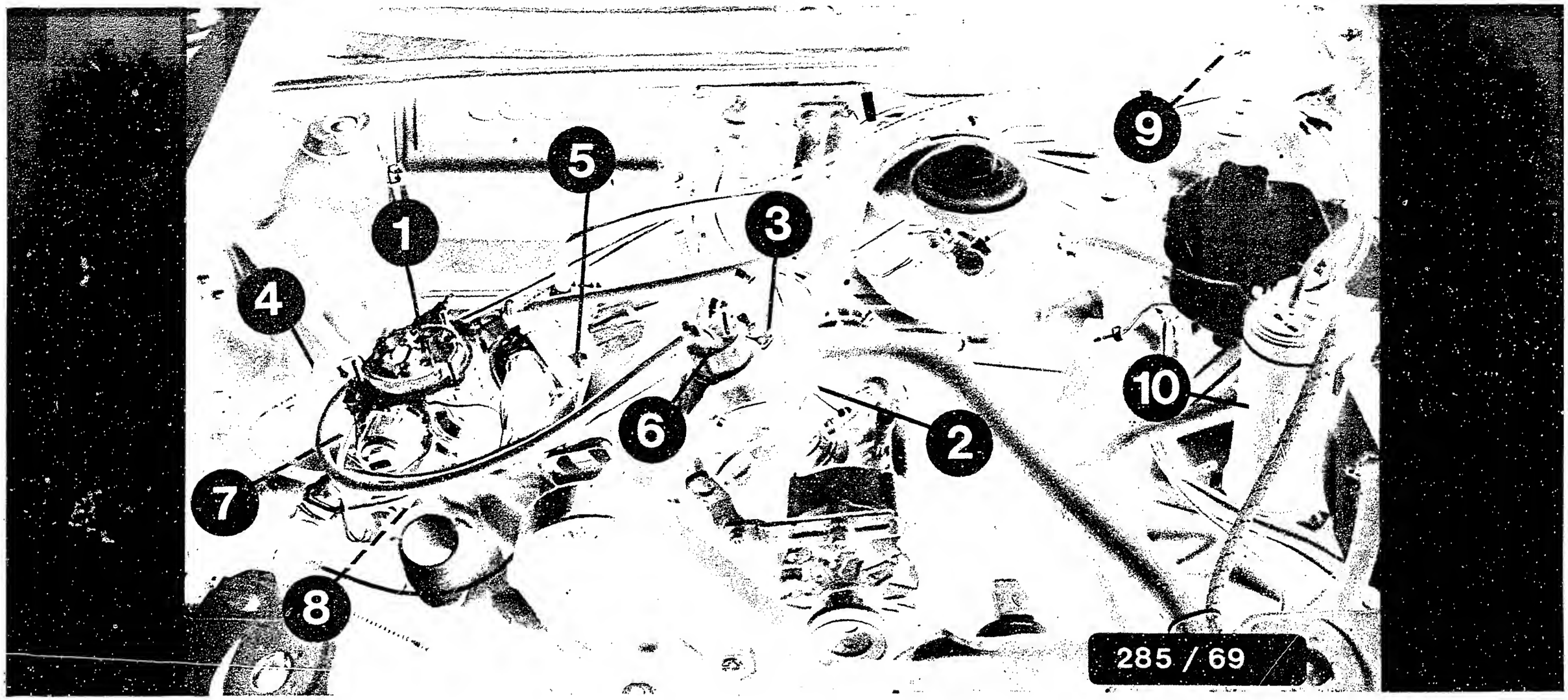
B1 = Coolant temperature sensor
B2 = Intake-air temperature sensor
B3 = Throttle-valve potentiometer
B4 = Lambda sensor
F1 = Fuse, control unit
H1 = Diagnosis lamp
(vehicles up to 06.88)

K1 = Relay, intake-manifold htg.
M1 = Choke valve actuator
R1 = Intake-manifold heating
X1 = Control-unit plug
X2 = Control-unit plug
Oil-pressure check

X3 = Diagnosis plug
X4 = Connector
Ignition trigger box
X5 = Connector
Transmiss. identifier
Y1 = Tank-ventilation valve
Y2 = Throttle-valve position.

M23 — ⟹

M24 — ⟸

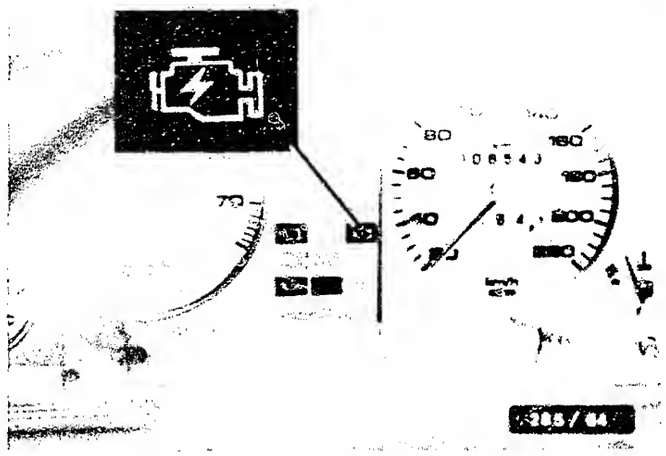


INSTALLATION POSITION OF COMPONENTS

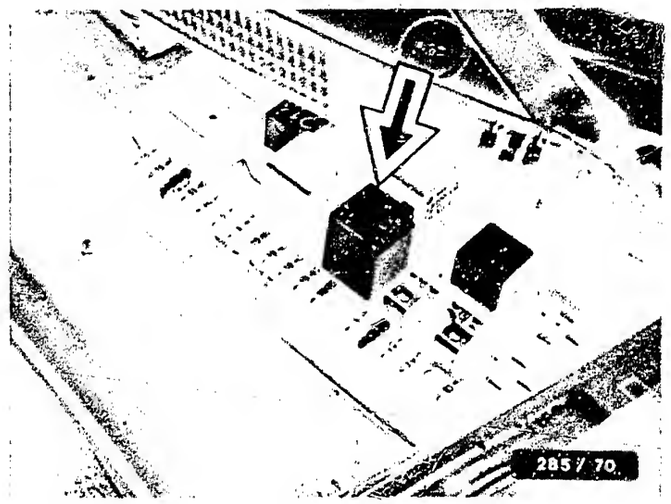
1 = Carburetor
2 = Ignition distributor
3 = Temperature sensor, coolant
4 = Activated carbon filter, control valve
5 = Temperature sensor, intake manifold
6 = Vapor-bubble separator
7 = Sampling pipe for CO measurement
8 = Lambda sensor
9 = Central electrics
10 = Activated carbon filter

INSTALLATION POSITION OF COMPONENTS (continued)

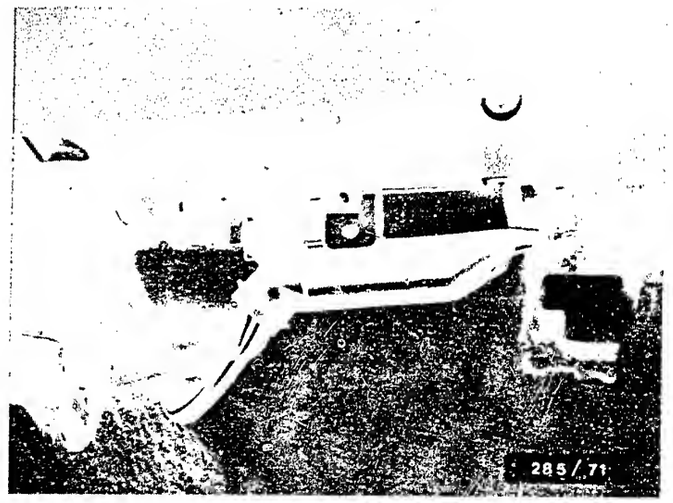
The fault lamp is located in the instrument panel (upper illustration).



The relay of the intake-manifold heating is located in the central electrics (center illustration, arrow).

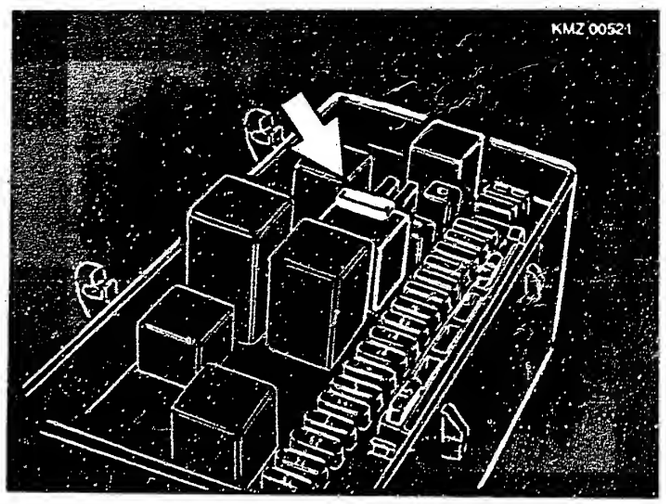


The control unit is installed in the right-hand footwell beneath the cover (already removed in the lower illustration).



INSTALLATION POSITION OF COMPONENTS

The intake-manifold preheating relay is in the central fuse box on the left of the passenger compartment.



Location of diagnosis plug

-> 08.88 at relay, intake-manifold heating (top picture, arrow)

08.88 -> in driver's footwell (bottom picture):

* Diagnosis plug A
  Contact 2 (+)
  Contact 1 vehicle ground

* Diagnosis plug B
  only contact 1 used.